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Give and Take

PROGRESS in aircraft design and development receives no better stimulus than healthy international rivalry and competition, but, paradoxically perhaps, the free interchange of technical information between countries can also be of the greatest practical value. Between the British and American aircraft industries both the rivalry and the interchange exist, and in their individual ways both are important ingredients in cementing the friendship and alliance of the two Powers. Out of a wartime unity of purpose has developed a strongly integrated association to guard against war, so much so that military and technical secrets can be and are freely exchanged between two countries that commercially are competitors in the world's markets for aircraft and other defensive machinery.

Omitting atomic secrets and the weapons based on them as being beyond the scope of this discussion, there can be little doubt that the most important piece of "reverse Lease-Lend" information to travel across the Atlantic was the Whittle turbojet, sent West following a request in 1941 by General Arnold, then C.-in-C., U.S.A.A.F. That upon this unit were based America's early gas turbines is a fact that is often overlooked. To name a single *quid pro quo* is not easy, but of the mass of practical and experimental data assembled in America since the war the parts concerned with aerodynamic research, and, in particular, experience with very large and very high-speed aircraft, at least a portion has been made available to our own designers.

Though Britain's post-war necessity to order American transports for her airlines was naturally a somewhat bitter pill for the industry to swallow, there is some compensation in the knowledge that British gas turbines are being produced for American aircraft. That fact, however, has been far less widely publicized and there does indeed seem to be a reluctance to give due credit for British ideas and products used in America. A case in point is the design of the Nene, or Turbo-Wasp as it is called in the U.S.A. The exuberance of one American correspondent in first extolling the virtues of the "new, most powerful American turbojet" and adding that examples built in America are better produced than are those built by the parent company in Derby is one example of this attitude, though not a typical one. Equally, it is an unintentional tribute to the co-operation from which such a state of affairs could arise; and, in fact, at high levels understanding between company and company—as shown by agreements such as those negotiated between Rolls-Royce and Pratt and Whitney—has, we know, been genuine and complete.

Joint Conference

The Anglo-American Conference, recently concluded, provides a good example of the way in which technicians can profit by personal contact and interchange of ideas. More than one British delegate expressed regret that the period for reading of papers was so short and, in particular, that more time could not be allowed for discussion. On this occasion some first-class lectures were presented, and deserved (but could not receive) adequate time for digestion. So vast is the aircraft industry in America, and so prolific the contributors of papers on every conceivable subject within its confines, that, especially for the Englishman, it is not always an easy matter to sift the grain from the chaff.

The Americans' present spy-nervousness is understandable, for they are aware of the tremendous influence they wield as a nation and the responsibility they carry as producers of the atomic bomb. If in recent months there has seemed to be some tightening-up in security and a reluctance to impart technical information (in some cases to this country) it is probably a reflection of this feeling. More than one leading figure in the British aircraft industry has advocated a similar reticence here.

Important data and "know-how" are abundantly available on both sides of the Atlantic. It is our view that within the bounds of security the two countries should first continue to agree to a free exchange of such information, next make the best unprejudiced use of it and, finally, give fair credit where it is due. Understanding and good relations will in this way be preserved and the greatest benefit be derived.

Two of the several R.A.F. aircraft which flew from Leconfield to take part in the Brough Display. Left is a Lancaster (with two feathered) and right, W/C. Donaldson slow-flying his Meteor 3 with "everything down".

East Yorkshire Day

Brough Air Pageant and Cirrus Trophy Competition

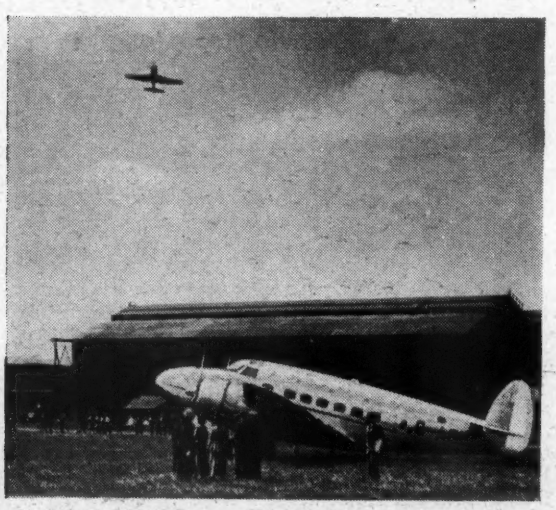
Illustrated with "Flight" Photographs

TWO-AND-A-HALF hours of well organized and assorted air display was provided last Saturday for visitors to the Brough Air Pageant organized by the local branch of the Royal Aeronautical Society with the co-operation of Blackburn and General Aircraft, Ltd. Those with experience of air displays agreed that the programme was most ably organized and conducted and that the radio commentator, appropriately christened "Mike" Byrne, contributed in no small measure to the close interest taken by spectators.

At a small official luncheon before A.V-M. D. A. Boyce "launched" the pageant, Mr. Robert Blackburn gave well-deserved praise to the energetic Brough R.Ae.S. Branch and to the members of his staff who year by year give their time to the Society and to the organization of the Display—proceeds from which, incidentally, are presented to the R.A.F. Benevolent Fund. Some 4,000 spectators attended from Hull and the surrounding East Riding countryside.

The programme opened with a flourish after the departure of the Auster entrants in the Cirrus Trophy competition, when Mr. G. F. Bullen (Blackburn production test pilot) took off in the Y.A.1 for an aerobatic display and P. G. Lawrence, the chief test pilot, made a rocket-assisted departure in a standard Firebrand. By way of demonstration, Lawrence jettisoned his drop tanks (a scrap pair filled with water) with a spectacular if muddy splash on the boundary bank of the Hull estuary.

Events then followed in rapid succession. A Tiger (pilot R. Hilken) achieved some phenomenal attitudes and manœuvres in a "dim pupil" display; two Spitfire 16s from Leconfield (F/Ls. Easy and Dell) did some pleasing line-astern aerobatics; three R.Aux.A.F. Meteors from Finningley, led by S/L. Ayton, entertained with some nice formation flying; and W/C. Donaldson, D.S.O., D.F.C., A.F.C. (yes, the brother) in another Meteor, gave a very impressive individual demonstration of all the aircraft can do.



Blackburn's S.28/43 Firecrest (Y.A.1), with powered ailerons, during an individual demonstration of handling and aerobatics.

A club handicap race over a short closed circuit entirely within the view of the field provided an exciting dead-heat finish between two Proctors flown by Lawrence and Bullen (no fiddle, we were assured). The Tiger, third, another like it and the Swallow and Auster were all very close behind.

A Lancaster from Leconfield (A. I. Denham at the wheel) rumbled over on two engines and later gave all a chance to gaze into its yawning bomb-bay from about 50ft. Two Mosquitoes flown by F/L. R. Lelong and F/O. Cotter, D.F.C., made a slightly anxious first transit on one pair of fans between the two of them, and returned later to bomb the set-piece with very commendable accuracy.

T.A. Paratroops

An excellent demonstration in a class of its own was the drop by 299 Airborne Squadron, R.E. T.A. Leaving their civilian occupations just in time to prepare for the event, four sticks of men from this local Territorial Unit, preceded by a drifter, made exemplary descents in a fresh wind. R.S.M. Lambert loudspoke about what was going on, verbally shrugging-off the fact that one man had merely jumped among the shrouds of a fellow "paranaut." All descended safely from their Dakota and landed within the airfield boundaries.

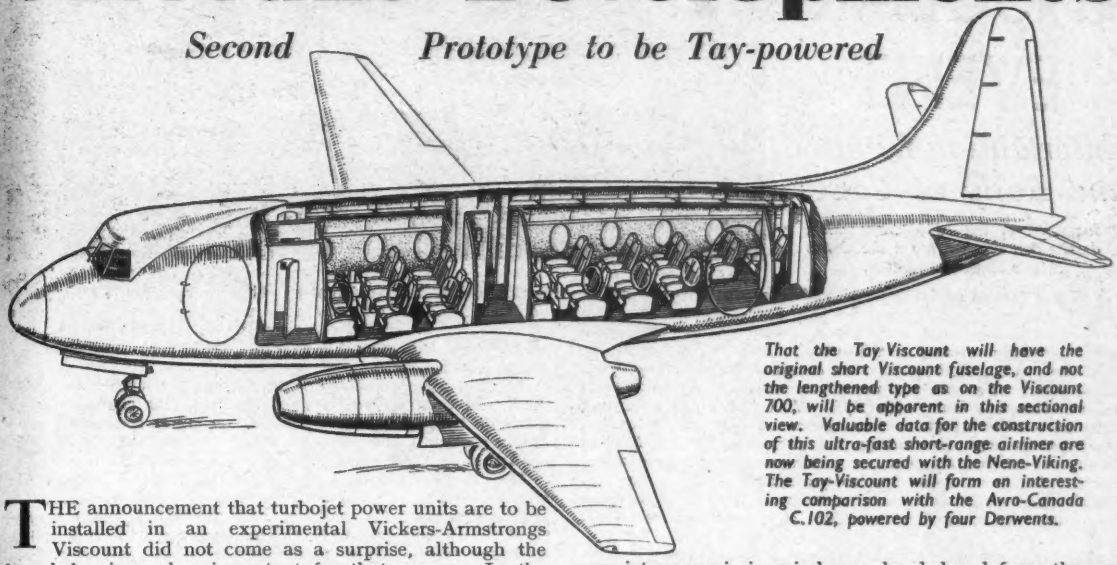
The programme was completed by more Firebrand flying of a polished kind, by model flying, by a demonstration of the Slingsby Motor Tutor with power (and, perhaps more impressive, as a glider with engine stopped) and finally by a Mr. Willy Hittit who picked-off beer bottles with a rifle from the rear seat of a Tiger (or did he?).

The later part of the programme saw Cirrus Trophy competitors return for the checking of their speed, navigation and (particularly) fuel consumption over a 150-mile course. The brothers, Lt. Cdr. H. C. N. and A. G. J. Goodhard, R.N., with their own Auster from Bocombe Down, won comfortably with 194½ marks out of 205. They averaged only 88 m.p.h., but used a remarkably small quantity of fuel at a rate of 3.83 gall/hr—equivalent to 22.9 m.p.g. Last year the competition was won at 99 m.p.h. and 4.1 gall/hr. Part of the secret of their success was a mixture control designed and fitted by the pilot for the occasion. The engine speed used was 2,250 r.p.m.

We may fittingly conclude by quoting the misprint in the programme which described Mr. Joe Gadd as "Circus engine advisor." With characteristic poker face he remarked to us that this was perfectly in order, as he was used to dealing with clowns in connection with his well-known infernal-confusion engines.

Viscount Developments

Second Prototype to be Tay-powered



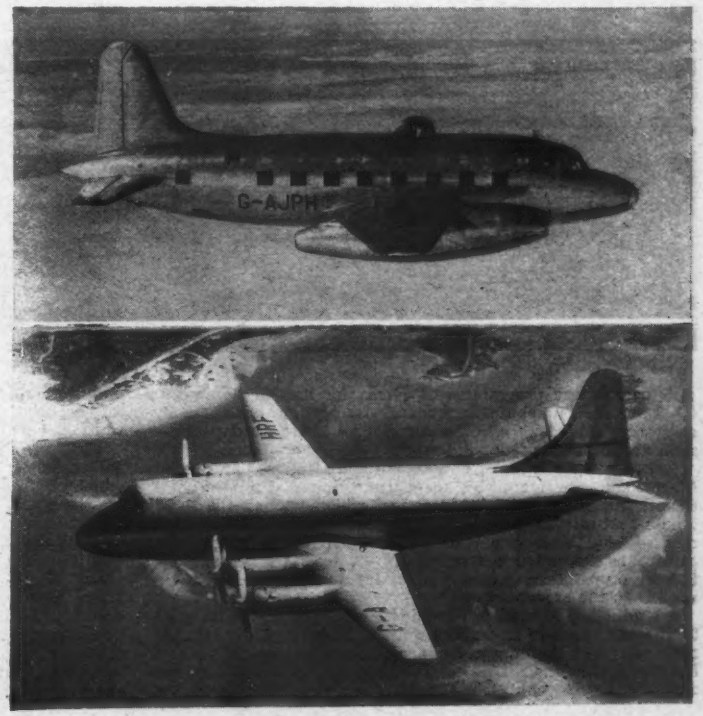
That the Tay Viscount will have the original short Viscount fuselage, and not the lengthened type as on the Viscount 700, will be apparent in this sectional view. Valuable data for the construction of this ultra-fast short-range airliner are now being secured with the Nene-Viking. The Tay-Viscount will form an interesting comparison with the Avro-Canada C.102, powered by four Derwents.

THE announcement that turbojet power units are to be installed in an experimental Vickers-Armstrongs Viscount did not come as a surprise, although the knowledge is no less important for that reason. In the seemingly short time since Rolls-Royce introduced the Nene-Lancastrian flying test-bed—hailed as the first passenger-carrying aircraft to fly on jet power—the Vickers Company, who are contenders for the title of leading producers of turbine-powered airliners, have, in conjunction with the Derby firm, constructed and obtained considerable operational experience with both a pure-jet and a turboprop transport. The original Nene-Viking—an experimental aircraft—serves to provide a great deal of data which will be used in the later designs. It was, in fact, the first true airline type to fly entirely on jet power.

From the start, the Viscount made a strong appeal to all associated with it, and many people have not hesitated to give their opinion that the absence of an order for the Corporations is a serious error of planning. The situation may still be remedied at this late hour. This outstanding four-engined transport performed well from its first take-off, and, thanks to excellent workmanship and development by Rolls-Royce, each of its four Dart turboprops can now deliver some 400 s.h.p. more than they did at the outset. The weight of each unit being 850 lb without airscrew, the 1,400 s.h.p. output of the Dart R.Da3 gives a figure of 1.76 s.h.p. per lb weight, or a weight/power ratio of 0.56 lb/h.p. The outcome of the increased power, as is now well known, is to be an improved and enlarged Viscount (3,000 lb. higher A.U.W. and a maximum of 52 instead of 43 passengers) known as the "700," construction of which was begun some time ago. This aircraft, in which full advantage will be taken of the more powerful turboprops, is expected to have several outstanding qualities, notably smoothness and silence, in addition to exceptional reliability in operation. The prototype Viscount completed the initial phase of its flight trials last month and is being fitted with its pressurization system.

That there may be a later stage for which pure-jet power is in mind may be deduced from the announcement that the second Viscount prototype will be powered by two Rolls-Royce Tay turboprops. Nenes were first mentioned, and it may be presumed that the Tay is similar, though of later conception. Confirmation of this deduction is also given by various American announcements—not yet officially confirmed in this country—that Pratt and Whitney are to build the Tay, a later and more powerful version of the Nene, and by information from the Hispano Suiza company (who are also building the Nene under licence) to a similar effect.

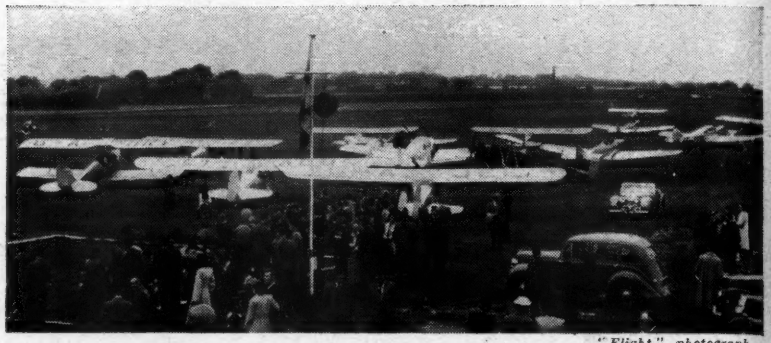
The Tay-Viscount is being built to Ministry of Supply order purely for research and development, and judging from progress to date it should fly late in the autumn.



The Nene Viking (upper view) and the Dart-engined Viscount are the two Vickers types which have been providing much of the basic data for the later aircraft.

INSULAR EVENT

Entertaining Display and Rally at Cowes



Some few of the 70 aircraft which, despite dull weather, made the Cowes show a successful venture.

"Flight" photograph.

AT the first of a planned series of three displays and rallies —the next is scheduled for July 17th—Cowes Aero Club had a successful attendance of some 4,000 spectators and 55 visiting aircraft last Sunday. After Brigadier R. L. Hutchins, M.C., A.R.Ae.S., had declared the meeting open, the sequence of events got under way with a quiet but nevertheless attractive start with F/L. W. L. Jennings executing some extremely pretty manœuvres in an Olympia sailplane. As Jennings was concluding his performance, C. Nepean Bishop got off in a Magister for a demonstration of aerobatics. "Bish" has been flying for 20 years and, sensibly enough, did his piece at about 1,200ft; a Magister, however, is by no means the best aircraft with which to demonstrate hesitation rolls.

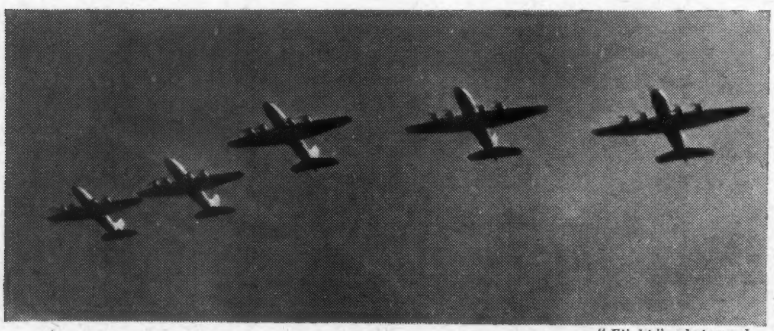
The third item on the programme was by Hawker test pilot E S. ("Doc") Morrell. He crazily flew a Tiger Moth in a manner that we have seldom seen equalled and never bettered. The great thing about his performance was that it was all done at the lowest possible speed to cover control requirements: a polished example of brilliantly bad flying. After an amusing "Colonel Crackshot" turn which nostalgically recalled displays in the "good old days," those who fancied themselves as air bombers took off and had a go at attacking a target with bags of sawdust. Mostly, the efforts were sharply good or bad, the common fault being late release. G. S. R. Maunders and M. W. B. May (Austers) managed, however, to win the competition with direct hits.

There was then a contretemps when a warning red Very flare set light to the airfield; the fire, however, was soon subdued. The general occlusion of strato-cumulus broke somewhat, and during a temporary bask in most welcome sunlight, Neville Duke gave a most professional exhibition of aerobatics in his Hawker Tomtit. This aircraft, built in 1931, is believed to be the only example remaining; with its Mongoose 3C sounding as healthily as ever, it was taken through a complexity of manœuvres, among which stall turns were a positive joy to watch.

Another slight contretemps arose when the wind temporarily died, and Control fired a smoke cartridge to change runway direction by 180 degrees. Some of the pilots seemed unaware of this change, and in one case a Magister was taking off whilst an Auster was coming in to land in the opposite direction.

The efforts of pilots to burst clusters of balloons with their airscrews were not markedly successful, perhaps because of the smallness of the balloons and the dull light; however, C. R. N. Bishop and A. E. Coltman managed to do it and so won their prizes. This was followed by what was undoubtedly the high spot of the afternoon: Morrell in a Tiger and Duke in his Tomtit engaged in a dog fight. Perhaps Neville Duke's prowess as a fighter pilot stood him in good stead, for he followed the Tiger's tail as if tied to it: it was a first-class demonstration of working aerobatics without ham-fistedness. Morrell had a passenger for half the fight in the person of O. Owen, who made, according to the programme, "a leap to safety," coming down from about 1,500ft in a nice demonstration of parachute jumping.

R. Langridge ably demonstrated the flying qualities of an Autocrat, as did P. B. Hill for a Proctor; then, following a general fly-past of Club and visiting aircraft, Brigadier Hutchins presented the various prizes. In addition to the results already mentioned, the *Concours d'Elegance* prize was awarded to M. W. B. May's Auster, and the prize for the oldest aircraft to J. Heath's B.A. Swallow. The arrival competition was won by Best-Devereux (Piper Cub).



"Flight" photograph.

AIRBORNE AT ALDERSHOT

R.A.F. in All-day Reunion Programme

A close formation fly-past showed past and present members of the Parachute Regiment that, as a trooper, the Hastings possesses all the essential qualities.

AS part of the programme of events for its Old Comrades' Day, the Parachute Regimental Association, with R.A.F. assistance, staged an effective air display last Saturday afternoon at Queen's Parade, Aldershot.

Jumpers from the 14th Parachute Battalion, Territorial Army, and the recruiting team from the Airborne Forces Depot, put in some useful practice, which was at the same time a first-rate display item. Two balloons from Cardington ran a "shuttle service" to 700ft, from which height the paratroops descended in batches of five, accompanied by their R.A.F. despatchers, whose voices, incidentally, were clearly audible to the crowd below.

A loudhailer, located in the middle of Queen's Parade, gave to the parachutists instructions in countering the prevailing breeze and, to the non-professional section of the audience, a further useful insight into training methods. When one canopy collected more than its fair share of wind, and the man beneath descended in some trees fringing the ground, the reaction of the lookers-on was discernibly divided into whispered feminine concern and rousing male cheers.

First of an appropriate selection of flying items was a demonstration, by an Army pilot, of the Sikorsky Hoverfly 2, which rescued the occupant of a rubber dinghy "floating" on the grass. Pilots of Transport Command and the Glider Pilot Regiment made a joint appearance in a well-co-ordinated fly-past of Dakotas and Horsas.

Although a new combination, the Hastings and Hamilcar, which also flew past, certainly seemed a well-matched pair. There were two further offerings by Transport Command, in the shape of three Valettas and five Hastings, which flew over in extremely steady formation. The final item, by a Meteor 4 of No. 11 Group, Fighter Command, was inevitably restricted by height, but the pilot deserves credit for leaving behind an excellent impression—and some remarkable shock-wave effects.

UNIQUE ANNIVERSARY

Ministers and Manufacturers Honour a Pioneer Firm

Four of the principal speakers at the Grosvenor House dinner. With Sir Frederick Handley Page are (left to right) Mr. Strauss, Minister of Supply, Lord Brabazon and Lord Pakenham (Minister of Civil Aviation). The Lord Mayor of London, Sir George Aylwen, proposed "The Pioneers of Aviation."

A GATHERING some 400 strong and comprising a very large number of the leading figures in British aviation assembled at Grosvenor House, London, last Friday to honour the Handley Page Company and its founder on the occasion of their 40th anniversary. Almost every pioneer who could possibly be present had been invited.

During the excellent dinner Sir Frederick Handley Page read out some of the sheaf of telegrams of congratulation which had been received. That he was in first-rate form was apparent at once from the spontaneous comments he made during the reading. Messages had been received from Mr. Winston Churchill, Sir Stafford Cripps, Mr. A. V. Alexander, Mr. Arthur Henderson, the American Institute of the Aeronautical Sciences, Royal Aeronautical Society, Royal Aero Club, Air Registration Board, Air League of the British Empire, Society of British Aircraft Constructors, Lord Douglas, Dr. Plesman, the Institute of Transport, the Livery Company of Coachmakers and Coach Harness Makers, the Bristol and de Havilland companies, B.O.A.C., and the A. and A.E.E., Boscombe Down—to name but a few.

Mr. G. R. Strauss, M.P., Minister of Supply, said that in proposing the toast of "The Fortieth Anniversary of the Company" he felt sure he would have the support of all present and of all who knew of the contribution to civil aviation and to the defence of the country made by Handley Page, the first aircraft manufacturing company registered in this country. He went on to recall briefly some of the outstanding H.P. aircraft built for the 1914-18 war and between the wars. In the second World War more than 6,000 Halifaxes had been made, there had been 76 Halifax squadrons and a quarter of a million pounds of bombs had been dropped by them in the course of 76,000 sorties. The mainspring of this record of achievement and the inspiration had come from Sir Frederick Handley Page, the founder.

"Cussedness"

"What are the qualities that bring success?" asked the Minister. "The pioneering spirit, technical knowledge and an outstanding quality which may be expressed in one word, 'gusto.' This is one which H.P. puts into everything—work, fun and cussedness." He went on to say that Sir Frederick was held in high regard and affection throughout the industry.

Seconding the toast, Lord Pakenham, Minister of Civil Aviation, paid a personal tribute to Sir Frederick, then went on to speak of his products. The Ministry, he said, believed tremendously in the Hermes. He was advised by his experts, who never agreed, but in this case, and it was a healthy sign, there was a great deal of unanimity. The purchase of aircraft from across the Atlantic had been right at the time but, if British products were available, it was far more satisfactory to buy them. Regarding the operators, there was no need to be pessimistic about the Corporations, who were doing a fine job in the face of difficulties. He sensed a coming-together between manufacturers and operators which was to the good. H.P. himself was at once a salesman and a statesman.

Replying to the toast, Sir Frederick Handley Page said that he was profoundly moved by the tributes to his Company and himself. He missed the many old friends who made up, as it were, the background of one's own life, but he was genuinely glad to see so many others present. Going on to speak of early aircraft designs, Sir Frederick said that Mr. Churchill, when First Lord of the Admiralty, had given a first chance to big aircraft, which were wanted to bomb Bergen and Breslau, and he recalled the "Bloody Paralyser," with its 72 m.p.h. speed, its six 112-lb bombs and its 5 lb/sq ft wing load. Sir Frederick added that he felt that the people in the Government to-day had equal foresight in air matters.

Continuing, he said that he remembered in particular the 1917 machine to bomb Berlin. On or about September 27th he had told Lord Weir that the machine would have an all-up weight of 30,000 lb, a span of 126ft and a wing area of 2,866 sq ft—the span, be it noted, was bigger than that of the Constellation. As indicative of the extraordinary simplicity of machines in those days in October, 1917, no pencil had been put to paper for the design, yet by April, 1918, the first one was flying, and by October, 1918, several had been built.

After the war, in 1918, the Company had gone into civil aviation The slotted wing had brought "salvation, safety and security to all mankind." The Company had extracted £¾ million from it home and abroad which had been ploughed back and had permitted enterprise and development within the Company. Later, adjustment of the linkage made possible the automatic operation of the slot. The device was still playing its part but, unfortunately, the patents had run out.

Sir Frederick next paid a tribute to members of his staff, naming many, including Mr. Hamilton—unfortunately not present—Mr. Stafford, Mr. Smith, and two Mr. Robinsons. No company existed on one man, concluded Sir Frederick; "I shout the odds but the others turn out the goods."

"The pioneers of aviation" were proposed by the Lord Mayor of London, Sir George Aylwen, who named many of the pioneers present on the occasion. Lord Brabazon, Sir

Together again from Hendon days are Bernard Isaac, H.P. and Claude Grahame-White.

Francis McClean, Grahame-White, T. O. M. Sopwith, Air Chief Marshal Sir Arthur Longmore, A.V.-M. Sir Charles Longcroft, Robert Blackburn, Oswald Short, Marshal of the R.A.F. Sir John Salmond, A. M. Desoutter, Sir Richard Fairey, Gordon England, Dukinfield Jones, Major Sippe—these, he said, were names to conjure with in aviation.

Referring to very early days, the Lord Mayor said that his company had liked the mild and quiet manner of the young Handley Page who had approached them and had lent him money to enable him to reach his opulent position to-day. "H.P. always went away with what he wanted."

The Lord Mayor then called on "Aviator No. 1" to reply to the toast, and Lord Brabazon, replying, said that he did not think there could be many more occasions on which to have present those connected with aviation from the very beginning, so it was right to make a fuss of them. He recalled that in 1906 he had designed and built a machine which never looked like flying—nor did it. With his early Voisin it was the last 30 r.p.m. which made possible the hop. One flew without coat or boots and a gust was usually responsible if the machine rose at all.

He recalled his preparation for the *Daily Mail* prize flight with Shorts on the Isle of Sheppey. He was up every morning an hour before sunrise in the hope that there would be no wind (assessed by "whether or not one could walk after one's cigarette smoke"). No one of the modern school, he thought, would remember being launched on a rail with the help of weights and rope. Having been turned into wind one pulled the trigger when one was feeling brave and then, at the end of the rail, had to do something about it. Lord Brabazon paid tribute to Sir Frank McClean and said that had he not spent time in travelling to the other side of the world to see an eclipse he would probably have been pilot No. 1. He also recalled the Hon. C. S. Rolls, "an imaginative and restless spirit," whose death had been a great loss.

Aviation, concluded Lord Brabazon, had had some lean years, but we looked forward now from the start of a time when aviation was on top as it deserved. The pioneers were honoured to have played a small part at the very beginning.

The Employees Celebrate

The celebrations continued next day, Saturday, in very different surroundings, when the employees at the Cricklewood, Radlett and Park Street factories were entertained by the firm to large-scale festivities on the Radlett Airfield.

Everything was on the grand scale: 1,250 sat down to luncheon in one of the big hangars and the arrival of next-of-kin (on free rail tickets) swelled the numbers to some 5,000, all of whom were entertained to tea. There were bands, variety shows, a miniature railway and a fun fair replete with all those ingenious devices designed to subject apparently willing victims to prodigious values of *g*.

Although, by virtue of the daily occupation of many of them, the guests might pardonably have shown little interest in matters aeronautical, one of the most popular attractions was a continuous display of winch-launched gliding put on by members of the firm's own gliding club, plus one or two aero-towed visitors from Dunstable.

At the luncheon, Sir Frederick made a characteristic "H.P." speech ("If we can only work half as loud as we can clap. . . ." ". . . the wages of sin are death, and our wages are a dam' sight worse") in response to a toast by Mr. A. A. Lough of the board of directors, and Mr. William Taylor (works engineer since 1918) made Sir Frederick a presentation on behalf of the employees; its nature—two magnificent vellum volumes of Skelton's *History of Don Quixote*—revealed the recipient in the hitherto unsuspected character of a keen bibliophile. Sir Frederick finally presented certificates to some thirty-five people who had completed either 30 or 25 years' service with the company.

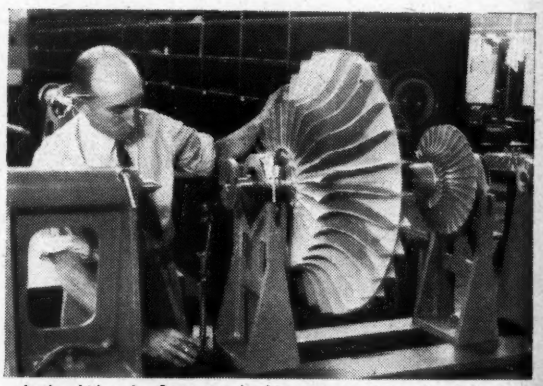
NENE PRODUCTION IN AUSTRALIA

ONE of the most notable examples of Overseas co-operation with the Home aircraft industry during the war years was the production by Commonwealth Aircraft Corporation, at Lidcombe, New South Wales, of both British and American engines under licence. Latterly, the Rolls-Royce Merlin 102 has been—and still is—in production at the factory, which is operated by the Corporation on behalf of the Government.

In 1946 a party of Commonwealth Aircraft technicians visited the United Kingdom in order to study gas-turbine design, development and production, and the sequel followed in 1947, when plans were made to build the Rolls-Royce Nene for installation in Australian-built de Havilland Vampires.

The first eight units are now being assembled, mainly from Derby-built components, but the proportion of Australian-made parts will be progressively increased until the sixteenth engine is wholly built by Commonwealth. Sheet-metal components are being fabricated and assembled by the Corporation's aircraft division, which, incidentally, is currently engaged on the construction of Merlin-powered Mustangs for the R.A.A.F.

Facilities at the three factories are good: the Corporation has operated its own light-alloy foundry for the past ten years, and a full range of light-alloy (including magnesium) components is in hand for the Nene. In the presswork section a new triple-action press has been installed, while broaching machines and other equipment for rotor manufacture have been added to the machine shops. For testing, there is a thoroughly modern house with a silencing system comprising a split exhaust with double detuner followed by perforated expansion tubes with upturned ends; the whole unit is surrounded by a brick deflector wall. Materials research and testing are conducted in a well-equipped laboratory.



At the Lidcombe factory: checking concentricity of a balancing coupling prior to the dynamic balancing of a Nene impeller and shaft assembly.

HERCULES OVERHAUL PERIOD

IN order to make the most efficient use of available man-power many producers of aircraft power-plants have thought it prudent to devote a large proportion of their labour capacity towards improving gas-turbine units; in fact, in the civil field development of existing engines during the last year seems to have taken priority over the design of new ones. The Bristol Aeroplane Company, pre-occupied as they are with Theseus and Proteus turboprops, have nevertheless continued to give much attention to the development of their Hercules and Centaurus sleeve-valve piston-engines. One particular endeavour has been to raise the overhaul period of the Hercules from its present 725 hours total to 800 and eventually to 1,000.

There is at present a trial batch of Hercules power units which are being run on to 800 hours. The first, a 634 from a Viking operated by Airwork, Ltd., completed its extended running period in April, and four in all have now been stripped and inspected after 800 hours' operation. The first engine referred to has, in fact, run for a total of 1,424 hours without change of any major component except pistons and one cylinder head. Such was the condition of all components on the occasion of the recent strip that the engine could clearly have continued in service for many more hours. When it arrived at the Bristol factory performance was checked on a dynamometer prior to stripping. The results are summarized below:—

SEA-LEVEL I.C.A.N. PERFORMANCE OF HERCULES 634.
Engine No. H.132142.

	Performance after 806 hrs.	Performance limits for a new engine.
Take-off power	1,655 b.h.p.	1,620/1,690 b.h.p.
Rated power	1,492 b.h.p.	1,490/1,550 b.h.p.
Oil consumption at rated power	11 pt/hr.	17.5 pt/hr. Max.

TECHNICAL MAJORITY

D.H. Technical School Comes of Age and Gets a New Home

ALL ex-members of the de Havilland Aeronautical Technical School, many of whom now hold eminent positions in the aviation world, will be interested to hear that on Saturday, June 18th, the School celebrated its 21st Anniversary. The occasion was also used to mark the removal of the School from the wartime premises to a more permanent home at Astwick Manor, on the northern side of the Hatfield aerodrome.

The opening ceremony was performed by the Marquess of Salisbury, K.G., P.C., who recalled that, many years ago, Astwick Manor had been occupied by an old gentleman called John Lloyd. He had lived to the age of 94, and all his days had retained an enormous zest for life. Lord Salisbury thought that this formed an excellent precedent for the students and hoped that, in their very different field, they might be imbued with the same spirit.

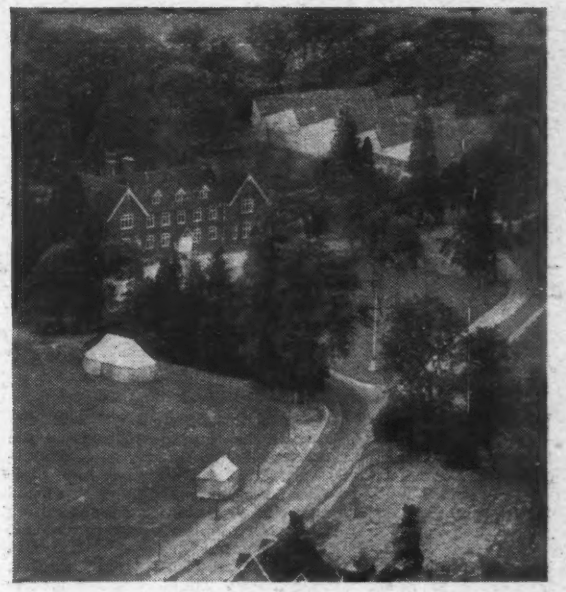
Merit and Opportunity

In its twenty-one years, the School has turned out some thousands of skilled craftsmen, as well as preparing and qualifying some 1,700 young engineers for technical posts. At the present time there are about 900 apprentices in training, roughly one-third of whom are in the senior category, taking the full course of theoretical tuition in addition to practical instruction in School workshop and factory.

Apprentices are drawn from all types of school in this country and from the equivalents of public schools overseas, selection at entry being competitive. Trade apprentices are accepted at about 16 and engineering apprentices at 17 years of age. An excellent feature of the School system is the upgrading of trade and engineering apprentices by yearly selection according to general merit and progress. By this means, opportunity is given to every youngster in an equal chance of rising according to his individual ability and effort. Furthermore, ten de Havilland scholarships for the engineering apprentices are awarded each year to new entry.

In addition to the apprenticeship schemes, engineering graduates are accepted from the Universities for practical instruction and, too, apprentices can return to the School after the interruption of their technical classes by military service.

The duration of the course for engineering and trade apprentices is at present four to five years, depending to some extent upon national service requirements. Apprentices train in aircraft, engines or airscrews, there being, in each division, courses aimed at careers on the design, production or maintenance side. The first year of training, for both grades of apprentices is basic, and is conducted in the School workshops, of which there are three, respectively at Hatfield for aircraft, at Edgware for engines, and at Bolton for airscrews. Thereafter, the apprentice is engaged on responsible work in the main departments of the factories.

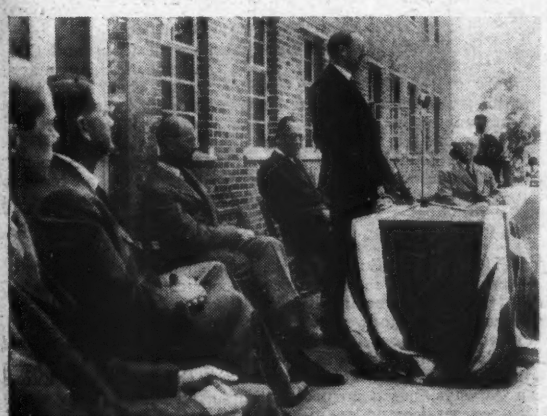


Here shown in the beautiful surroundings, Astwick Manor and the new workshops and drawing offices lie on the northern boundary of Hatfield aerodrome.

Lecture and other class-room work for trade and engineering apprentices occupy one or two days per week and, in the later stages, one or two evenings as well. All classes are recognized by the Ministry of Education. The staff comprises thirty-one whole-time lecturers and instructors and twenty-five part-time lecturers and instructors.

After the opening ceremony guests were able to inspect the new School premises and to view examples of students' work, all of which evoked merited admiration. The afternoon was concluded with a contrasting flying display in which Pat Fillingham ably demonstrated the handling qualities of the Chipmunk, and was followed by John Cunningham in a production Vampire. Cunningham flew with the superb precision for which he has become noted, his complete absence of flamboyance seeming to add to the impressiveness of his display.

Aircraft on view were a Tiger and a Hornet Moth, a Chipmunk, Beaver, Dove, Vampire 5 (Swiss) and Mosquito NF36 (Swedish).



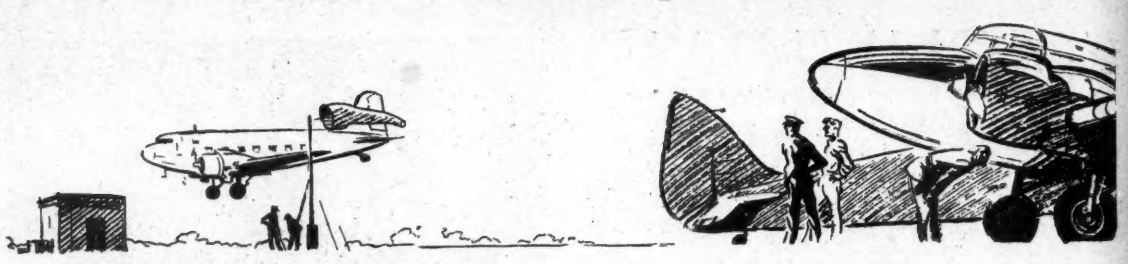
Left to right: P. E. Gordon Marshall, L. J. T. Brodie, A. S. Butler, W. E. Nixon and G. M. Saul-Brown listen to the Rt. Hon. the Marquess of Salisbury in the opening ceremony.

AERIAL SURVEY AND GEOLOGY

AN exhibition recently opened at the Geological Museum, South Kensington, deals with the use of air survey in geological studies, and companies of the Hunting Aviation Group in many parts of the Empire have contributed exhibits; in particular, Hunting Aerosurveys, Ltd., who arranged the final display, deserve congratulation on their informative treatment of what, to the layman, can be a very complex subject.

The display is shown on twelve screens. The first illustrates the methods and equipment used in aerial-survey photography and permits the visitor to study a stereoscopic view; next the preparation of mosaics—including one covering 5,000 square miles of territory—is shown, and the third display illustrates methods of mapping from photographs. On the fourth screen is explained the production of a contour model: the method is to construct the physical form with the aid of photographs and maps and then to secure as realistic visual plan-view by coating the form with a photographic skin.

The remaining exhibits in the display show specific applications of aerial survey to mining and geology. The exhibition is to remain open for several months.



CIVIL AVIATION NEWS

London's New Traffic Procedure : I.C.A.O. Progress : Italian Operations

THE FUTURE OF THE A.R.B.

IT is unlikely that the Air Registration Board will dispute the wisdom of any of the recommendations in the Helmore report except those which might affect its own independence. Complete independence of the Board is impossible in that certain functions can be performed only with official co-operation—as, for example, the provision of a flight-testing ground, and the solution of research and development problems.

The principle of independence has been jealously guarded in the past and the report has failed to produce any evidence that sacrificing the Board's independence would promote greater efficiency. In fact, an official tie with the Minister, particularly in its dealings with foreign governments, might cause an embarrassing situation. The desire that the Government should have greater control over the finances of the Board is prompted by the view that greater subsidies are necessary to cover an increasing deficit. For the normal functioning of the Board, subsidies (other than the granting of facilities already mentioned) would not be necessary if fees were charged for work done, including charges for work of a routine nature on behalf of the Ministry of Civil Aviation, such as the writing of requirements.

In the same way, the standing of the Board in the international sphere could be maintained at its present high level only by a council representing all interests, acting as an autonomous body, whereas a council of members nominated by a Government department might be open to criticism. Moreover, the Minister of Civil Aviation would be responsible for the Board and its functions, an undesirable situation in view of the responsibilities in aviation to which the State is already committed.

It should also be placed on record that the Board, whose efficiency has never been questioned, functions in its present form with a staff of only 220.

CANADAIR PROVING FLIGHT

ONE of B.O.A.C.'s new Canadair Fours left London Airport on June 14th for a proving flight to the Pacific. The aircraft, which carried technical observers from the Corporation, the Ministry of Civil Aviation, the aircraft manufacturers, Rolls-Royce and Marconi, will be away some 25 days, and total mileage is expected to be over 26,000. Landings will be made at 28 different airports and simulated instrument approaches at a further 14 between London and Manila. The route will be eastwards through Pakistan and India, and is intended to form an exacting test of the aircraft in changing climates to finalize operational procedure before the type is put into regular commercial service in the autumn.

CONFUSION AT NORTHOLT

TUESDAY, June 14th was an expensive day for more than one Northolt operator whose aircraft burnt many gallons of petrol over the exits and entrances around London. QBI conditions within 24 hours of introducing the new Metropolitan Control Zone procedures caused unprecedented delays in landing and take-off which, oddly enough, and in spite of expectations, did not occur at London Airport.

New procedures were designed in anticipation of the airways scheme which is likely to be introduced towards the end of this year; they incorporate extended boundaries to the control zone, more exit and entry points, and new holding patterns for both Northolt and London Airports. Regular operators had been consulted about the scheme and at their request safety conditions had been imposed in the form of 1,000ft vertical and ten-minute lateral separation at all points at the boundary and within the zone. For such safety measures the operators were prepared to accept the inevitable delay to movements.

The restrictions allow no flexibility of control, since the airfield is the critical point at which the ten-minute separation in landing and take-off must be maintained. The order of take-off and landing was sacrificed, but an average of four minutes between arrivals and departures is said to have been achieved. Throughout this confusion positioning flights were given low priority, causing further difficulties.

Ministry of Civil Aviation officials have subsequently discussed the situation with representatives of the operators and it is understood that some useful suggestions were made and are being considered in order to avoid a repetition. Since long delays were expected to occur it is strange that such ideas were not forthcoming earlier or that in their absence a new procedure should be introduced. While it is agreed that with the installation of radio ranges a complete overnight change of procedure would be unwelcome it would perhaps be better gradually to introduce a new scheme after the equipment has been fully tried out.

I.C.A.O. THIRD ASSEMBLY

IN a review of the year's work given on June 8th to the Third Assembly of the International Civil Aviation Organization, Dr. Edward Warner said that more nations were adopting international practices. Standards for technical and economic aspects of aviation were included in annexes to the Convention approved by the Council, five of which, designed to be incorporated into national legislation of member-nations, were already in force. The remainder would come into effect during the next eight months.

Dr. Warner drew attention to a demonstration of readiness to accept inconvenience and temporary disturbance in order to make national agreements effective—namely, the adoption by 34 members of a standard set of dimensional units. He also pointed out a significant decrease in the number of formalities required and the time taken for passengers and cargo to pass through customs airports. He said that much of the progress had certainly been a result of abandoning war-time controls, but he believed that a considerable share of credit was due to the concentration on the subject within I.C.A.O.

M.C.A. FIRE SCHOOL

A DEMONSTRATION of fire-fighting with foam and CO_2 gas was given before Mr. G. S. Lindgren, Parliamentary Secretary of the Ministry of Civil Aviation, when he visited the Ministry's Aerodrome Fire Service Training School at Cardiff on June 15th. The service has a strength of about 700 and is responsible for 37 civil airfields. It is intended that the Training School will, in the first instance, give every member of the service a standard basic training by the middle of 1950, after which refresher, promotion and specialist courses will be provided.

ALITALIA'S TWO YEARS

ALTHOUGH the Company was founded in September, 1946, the first seven months of the existence of Alitalia (Aerolinee Italiane Internazionali) were devoted largely to all the organizational groundwork necessary to a new airline. Starting with two internal services, covering a total of about 670 miles, Alitalia's aircraft first flew commercially in May, 1947. This Italian company, in which Great Britain, through British European Airways, has a 40 per cent financial interest, has since developed services on an international scale, both in distance and traffic capacity, and the original internal services have been abandoned altogether.

For services from Rome, Milan and Naples to London, Paris and Asmara, Savoia-Marchetti SW-95s, four-engined, 30-seaters are used; on routes to Nice, Geneva, Sicily, Malta and Tripoli

Civil Aviation News . . . . .

Fiat G.12Ls, three-engined aircraft accommodating 18 passengers are flown; and to Sao Paulo, Brazil, Rio de Janeiro, Montevideo and Buenos Aires, the company is using British Lancastrians. Other international services are contemplated later this year.

The total distance covered by Alitalia's routes has by now grown to 13,827 miles and, in the two years of commercial flying, some 155,211 hours and 2,840,563 miles have been logged. Passenger-miles amount to 26,944,047 and ton-miles of freight, mail and excess baggage to 1,253,153.

ERNEST CHARLES GEARY

HIS many friends in aviation will regret to learn that Mr. Ernest Charles Geary, K.L.M. regional operations manager in the United Kingdom, died on June 16th, at the age of 41, from a heart attack. He joined K.L.M. as assistant traffic officer in Croydon in 1925 when the company's staff here numbered four and two services flew each day between Croydon and Amsterdam. In 1934 he was appointed their traffic superintendent at Croydon, a post which he held up to the time of joining the Royal Air Force in 1941. His last appointment dated from 1947, and he was responsible for K.L.M flying operations at London, Prestwick, Ringway, Dublin and Shannon Airports

BREVITIES

AQUILA AIRWAYS, LTD., have been granted permission to use Limassol marine base in Cyprus. One of their Hythes was to have used the base recently while returning from a Southampton-Aden charter to collect a ship's crew.

* * *

Construction has now started on a new airport, four miles from Adelaide, to replace Parafield, which is 11 miles from the city and frequently closed by adverse weather. The new airport, which is being built on reclaimed land, swamps, marshes and sand dunes, will have a main runway of nearly 2,300 yd, with over-runs of 1,000 yd and 500 yd.

* * *

On June 9th Air India International completed its first year of flying London to India services. The airline flew 882,000 miles and carried 5,000 passengers. The addition of two more Constellations to the fleet will enable A.I.I. to increase the frequency of the service to three flights each week and also to operate a more frequent service between Bombay and Nairobi.

* * *

As a result of successful tests the Finnish airline Aero O/Y will, it is understood, purchase two Saab Scandias. A test flight was recently made over the route Helsinki-Waasa-Kemi-Rovaniemi-Helsinki for the benefit of officials of the airline and the Ministry of Communications, particularly to test the aircraft on the gravel and grass airfields.

* * *

Using a DC-6 chartered from British Commonwealth Pacific Airlines, Ltd., Trans-Australia Airlines are to operate a weekly return flight between Sydney and Perth via Melbourne and Adelaide. The flight will leave Sydney at 0805 hr each Sunday and arrive at Perth at 1910 hr. while the return aircraft will leave Perth the same evening at 2330 and reach Sydney at 1205 on the Monday. This service will reduce by 30 min the DC-4 Sydney-Melbourne and Melbourne-Adelaide runs, while 1 hr 30 min will be cut from the Adelaide-Perth journey.

* * *

During 1948 Pan American Airways' gross revenue amounted to $145,216,000, with an estimated net profit of $4,591,000 after payment of $22,920,000 Federal income-tax. Net profit for 1947 was $2,960,000.

* * *

Edited by Mr. E. M. Gurney, who flew with Imperial Airways and B.O.A.C. as captain of aircraft for nearly 20 years, an *African Air Guide* has been published by Allan R. Lawrie, Ltd., of Durban. Although it is not yet international in scope, the publishers hope progressively to expand it until it finally covers the world's routes.

* * *

The Ministry of Civil Aviation has announced the appointment of Mr. Raymond Birkett, D.F.C., as Assistant Civil Air Attaché, Paris. During the war he served in the R.A.F. as a navigator in 2nd Tactical Air Force and was awarded the D.F.C. in 1944. The Civil Air Attaché is Air Marshal Douglas Colyer, C.B., D.F.C., R.A.F. (retd.).

* * *

Lack of standardization on the Australian State airlines is expected eventually to create an acute dollar problem for the Government. Q.E.A. operate four Constellations and a fifth is needed to run an efficient public service; B.C.P.A. use DC-6s and T.A.A. have five Convairs. In addition, both T.A.A. and Q.E.A. have a number of DC-3s. All the airlines require more spares, for which dollars will be needed.

* * *

Swissair is now operating a twice-weekly transatlantic service between Zurich/Geneva and New York, leaving Switzerland on Mondays and Fridays and Idlewild Airport, New York, on Wednesdays and Sundays. Good connections are available at both Geneva and Zurich with other European countries. A third weekly service will be operated between June 22nd and July 15th and between August 24th and September 30th, leaving Switzerland on Wednesdays and New York on Fridays.

* * *

Since the "family fare" plan was introduced by American Airlines last September more than 76,000 people have used tickets under the scheme, and the airline has asked the Civil Aeronautics Board to grant an extension until March 30th, 1950. The plan enables regular ticket-holders to take husband or wife and children at half fare on the company's routes in the United States and Mexico on Mondays, Tuesdays or Wednesdays, and a survey has shown that 64.3 per cent of the passengers who took advantage of it would not otherwise have travelled by air.

* * *

On June 16th, the 30th anniversary of the formation of the International Air Traffic Association, Sir William P. Hildred, the Director-General, received an unusul memento—the desk which the late Sir Sefton Brancker was using at the time he signed the document which brought the Association into existence. Sir Sefton was at the time Director-General of Civil Aviation and Sir William subsequently used the desk when he filled that post from 1942 to 1946. Latterly it has been used by Sir Frederick Bowhill and it will shortly be sent by Sir William Hildred to the headquarters of I.A.T.A. in Montreal.

* * *

In conjunction with B.C.P.A., Q.E.A., T.E.A. and T.C.A., British Overseas Airways Corporation will introduce on June 30th a standard round-the-world-fare of £468, and for journeys via Australasia and the South Pacific. Passengers may break their journey at Sydney, Auckland, Fiji, Canton Island and

OFFICIAL TEST: Air Marshal Sir Alec Coryton, K.B.E., C.B., M.V.O., D.F.C., Controller of Supplies (Air), Ministry of Supply, recently paid a visit to the Armstrong Whitworth works at Baginton and flew in the Apollo.

Civil Aviation News . . . . .

Honolulu. Alternative routes across North America are available through either San Francisco or Vancouver to connect with the Atlantic services at New York or Montreal.

* * *

The overall journey time on the Air Ceylon Skymaster service to England has been shortened to 39 hr 30 min. The service leaves Colombo on Wednesdays, calling at Bombay, Karachi, Cairo and Rome, and the eastward flights leave London on Fridays.

* * *

Holding that the Commonwealth Government has no power to ration petrol, the Australian High Court has declared invalid the Act under which rationing was imposed. Airlines as well as users of motor vehicles have been affected and permission for new services has been refused because of the rationing.

* * *

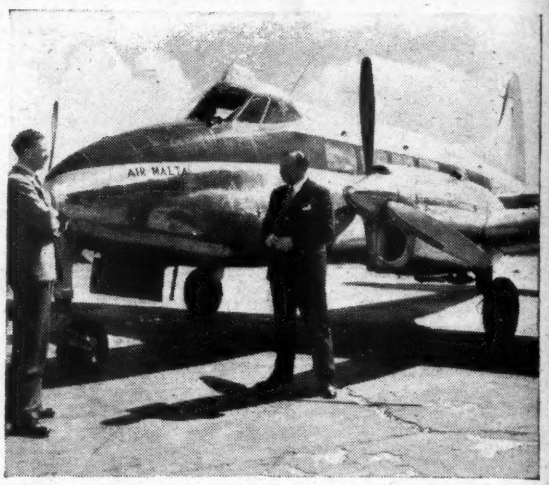
Air France started a direct Paris-Belfast service on June 13th. Operated with Languedoc aircraft, the service leaves Paris on Tuesdays, Fridays and Saturdays and Belfast on Mondays, Wednesdays and Saturdays. The flight takes just under three hours and the return fare is £28 16s, with a cheaper week-end rate.

* * *

At the recent I.A.T.A. annual technical conference at Burgenstock, Capt. J. C. Kelly Rogers, assistant general manager (technical) of Aer Lingus, was appointed second vice-chairman of the Association's Technical Committee. Following terms as second and first vice-chairman, Capt. Kelly Rogers will become chairman in two years' time.

* * *

Eight American airlines are understood to have rejected a plan designed by the Port of New York Authority to end the boycott of Idlewild Airport, which they have maintained since it opened in 1947. The proposed solution was a variable scale of landing fees on the basis of actual cost, to be determined periodically by accountants of both sides, with the American Society of Accountants as arbiter. The original dispute arose when the Port Authority attempted to alter its existing lease agreements with the airlines operating into La Guardia.



ISLAND DOVE : Air Malta, Ltd., is changing over to de Havilland Doves for its scheduled services radiating from the island, including the recently licensed extension to Cairo. The first one to leave England is here seen with A. Cdre. G. Powell (right), chairman of the company ; he is also chairman and managing director of the parent company, Silver City Airways, the chief engineer of which, Mr. R. B. Clarke, is on the left.

FROM THE CLUBS

THE Auster Flying Club, in conjunction with Auster Aircraft, Ltd., is holding an air display on Sunday, July 10th, at Rearsby Aerodrome, Leicestershire. The flying programme is scheduled to start at 1430 hr and will include individual aerobatics by a Meteor 4 and a Vampire; a display of aerobatics by various light aircraft, including a Miles 18, Sparrow Hawk, and Auster Autocrat; and high-speed flying by a Hornet. Spitfires of No. 504 (County of Nottingham) Squadron, R.Aux.A.F., from Wymeswold, and Seafires from the Royal Naval Air Station at Bramcote, will carry out formation flying. Other events will include a demonstration of parachuting, by Major "Dumbo" Willens, and a bombing competition.

* * *

THE International Rally organized by the Yorkshire Aeroplane Club during the week-end June 10th to 13th was attended by visitors from clubs in Belgium, France, Sweden and Switzerland. Mr. Freddy Van Gheluwe received a silver tankard on behalf of the Ghent Club for the largest Continental-club representation. Mr. Georg Lithander, who flew from Goteburg in a Saab Safir, received a similar award for flying the greatest distance, while other silver tankards were awarded to the owner of the most efficient aircraft, M. L'Huillier, who brought a Piper Super Cruiser from Geneva, and to the owner of the most attractive aircraft, M. Bob Menard, who flew a Piper Clipper from Carcasonne. Each of the male visitors was presented with a souvenir ashtray and each lady received a large box of chocolates and a basket of toffees—in view of the current confectionery situation, a very handsome award.

* * *

WHEN some 38 members of the Ultra Light Aircraft Association attended the third annual general meeting at Londonderry House they learned that although individual membership had increased only to 196 (from 182) during the year, group membership had grown satisfactorily and there were now 11 affiliated groups, which gave the Association a grand total of 655 members. It was proposed that a limited liability company should be formed under the name "Ulair, Ltd.," to be controlled by the Association through the general council, which would appoint the directors. The company would handle all finance and accept all liabilities on behalf of the Association proper.

The chairman announced that Mr. Peter Masefield had agreed to become president of the Association.

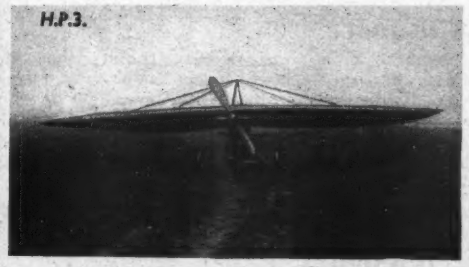
It was again maintained that the fundamental reason for the manufacturers' reluctance to develop ultra-light aircraft was the absence of a suitable production engine. The chairman of the Design Sub-Committee reported that private enterprise had been approached and a number of projects were under consideration. He then gave details of the progress made. There was some encouragement to be found in the successful flights of the Fairey Junior and the Slingsby Motor Tutor prototypes, both of which were powered by Aeronca J.A.P. engines which had been supplied by the Association with the assistance of the Kemsley Trust. In a search for an aircraft in the high-performance class the revival of the Chilton was being attempted.

EXPERIMENTAL SAFIR : A Saab Safir, fitted with a six-cylinder Lycoming O 435-A engine, was recently test-flown. This unit provides 190 h.p. for take-off and cruising speed is said to be 155 m.p.h. Take-off has been reduced to 160yd and the service ceiling increased to nearly 23,000ft.

H.P.1 "Blue Bird."

A Jubilee Collection of Handley Page Aircraft from "Blue Bird" to Hermes

Forty Years Famous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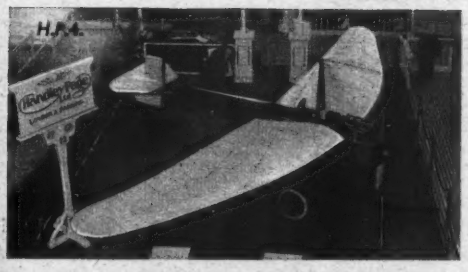
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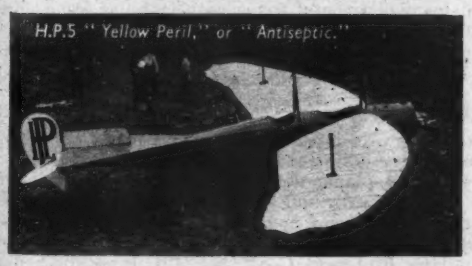
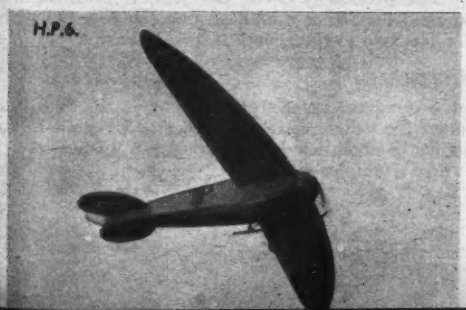

H.P.5 "Yellow Peril," or "Antiseptic."


H.P.6.

LAST week—as readers who read our "Portrait of a Pioneer" will be aware—the firm of Handley Page, Ltd., celebrated the fortieth anniversary of its existence. In that article we described the early work of Mr. (now Sir Frederick) Handley Page. Here, from the archives of *Flight* and the Handley Page Company, we illustrate the history of his firm's products.

The student, we believe, will be interested by the crescent-shaped wings of the early H.P. monoplanes and may muse on the form of wings yet to come from the forty-year-old firm. Should he be puzzled by the omission of certain type numbers, it may be explained that the absentees are, in the main, variants of secondary interest or projected types which never saw the light of day.

H.P.1 "Blue Bird"

First of the Handley Page powered aircraft (earlier experimental work had been conducted with gliders), the Blue Bird was built at Barking and first flew in 1909. It was so named by reason of its form and colour. The intrepid aeronaut seen at the wheel is, of course, the one-and-only "H.P.", in person.

H.P.3

Built for demonstration flying, and shown at Olympia in 1910, the H.P.3 monoplane followed on the heels of a privately ordered biplane (H.P.2), first flown in 1909.

H.P.4

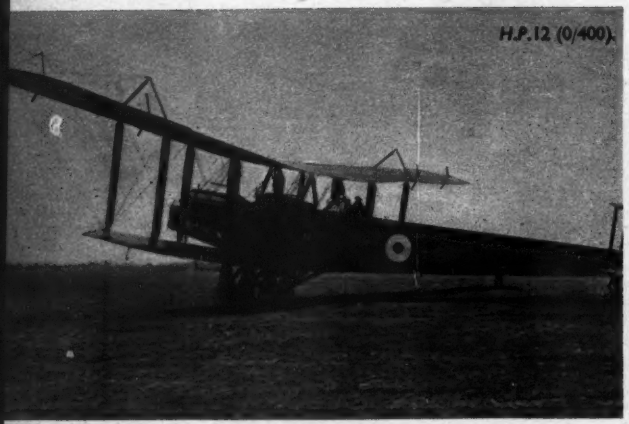
This 1911 monoplane, which has been described as "less efficient than handsome," was another H.P. Olympia exhibit. The engine was a 35 h.p., four-cylinder, water-cooled Green and the rear portion of the fuselage was a beautifully finished monocoque structure of mahogany.

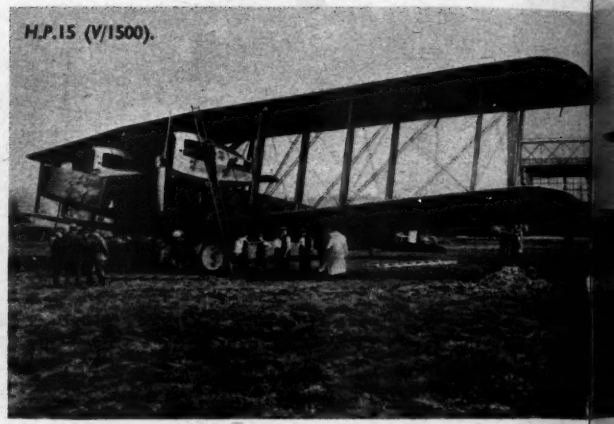
H.P.5 "Yellow Peril," or "Antiseptic"

The somewhat undignified sobriquets applied to this famous monoplane, dating from 1911, and retaining the crescent wings of its forerunners, arose from the non-rusting composition with which its surface was treated. Capable of 60 m.p.h., it measured 35ft in span and was fitted with a 50 h.p. Gnome. Reconstructed after a crash, it flew over London in 1912.

H.P.6

Built for the Military Trials, conducted on Salisbury Plain in 1912, the H.P.6 was a larger and more powerful machine than the "Yellow Peril." The engine was a 70/80 h.p. Gnome, and the pilot and passenger sat side-by-side. Lateness of completion combined with a damaged wing to prevent participation in the famous Trials.


H.P.12 (O/400).

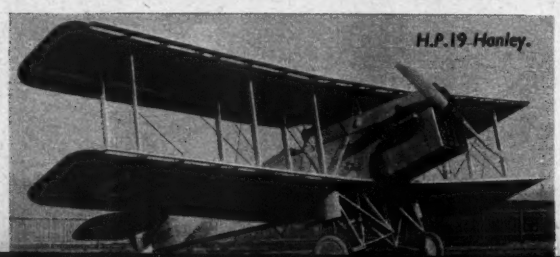

H.P.15 (V/1500).

Forty Years Famous . . .

H.P.7.

H.P.17 (Slotted D.H.9).

H.P.18 (W.8b).


H.P.19 Hanley.

H.P.7

The crescent wing form of earlier "H.P." monoplanes was retained for this biplane of 1913, but ailerons were fitted (on the upper wing only) instead of a wing-warping system as employed for the monoplanes. A 100 h.p. Anzani engine gave a speed of 73 m.p.h. Span and length were 40ft and 27ft.

H.P.12 (O/400)

A development of the O/100 of 1915 (the first successful large bomber, and the type which met the Navy's demand for "a bloody paralyser"), the O/400 first flew in 1917. Forty O/100s were built, but by the end of the war roughly ten times this quantity of O/400s had been completed. This historic type—operated against the Germans, Turks and Bulgarians—measured over 100ft in span and flew at a weight of 14,000 lb. Two Rolls-Royce Eagle 8 engines gave it a cruising speed of 85.5 m.p.h.

H.P.15 (V/1500)

The supreme Handley Page product of the Great War, the V/1500—or "Super Handley," as it was often called—was designed for attacks on Berlin. A total of 255 was ordered; the first flew in April, 1918, and three were ready to raid the German capital when the Armistice came. The V/1500's specification tells its own story: Engines, 4 R.-R. Eagles; span, 126ft; crew, 6; bomb load, 30 x 250 lb; top speed, 100 m.p.h. One of these giants carried forty passengers over London.

H.P.17 (Slotted D.H.9)

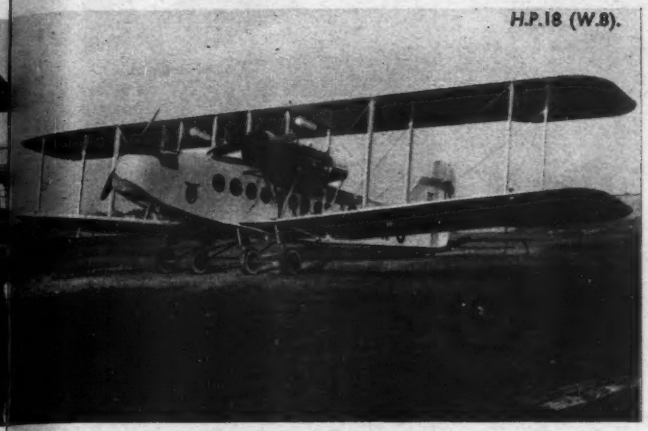
A standard Puma-engined D.H.9 two-seater bomber, modified for experimental flying with Handley Page slots, flew, in unslotted form, in April, 1920. Tests with the slots were outstandingly successful, and led to an order for the Hanley torpedo carrier.

H.P.18 (W.8)

The highest award in the Air Ministry's 1920 competition for commercial aircraft was easily gained by a twelve-seater Handley Page biplane, developed from the O/700 (civil version of the O/400), and known as the W.8. Later, at an International meeting in Brussels, the same aircraft was awarded first prize for commercial machines. Piloted by Captain (later Professor) G. T. R. Hill, it established a record in 1920 by lifting a load of 3,690 lb to a height of 14,000ft. The two engines were Napier Lions.

H.P.18 (W.8b)

Though having the same flying weight as the W.8, this development (first flight 1922) was powered by Rolls-Royce Eagle engines of much lower power (360 h.p. instead of 450 h.p.). Three examples were built.


H.P.18 (W.8).

H.P.24. Hyderabad.

H.P.19 Hanley

The first Handley Page aircraft designed to take advantage of wing slots was the Hanley deck-landing torpedo carrier, a three-bay biplane with manually worked slots along the leading edges of upper and lower mainplanes. This type, which was flying early in 1922, was a single-seater and was given a large ground angle to permit full advantage to be taken of the slots. The engine was a Lion and the flying weight was 6,500 lb.

H.P.20 (X.4B).

H.P.20 (X.4B)

A slotted cantilever wing, fitted to a Liberty-engined D.H.9a fuselage, constituted this 6,500-lb experimental machine.

H.P.21

Three examples of this remarkable deck-landing fighter were built in 1923 for the U.S. Navy. Despite a wing loading of 18 lb/sq ft, leading-edge slots, and slotted "drooping" ailerons allowed a landing speed of only 44 m.p.h. The 230 h.p. Bentley rotary engine gave a top speed of 146 m.p.h.

H.P.21.

H.P.22

For the 1923 Lympne Trials, Handley Page produced this tiny cantilever monoplane, weighing only 430 lb loaded, and powered by a 397 c.c. A.B.C. engine. The ailerons were slotted and drawings were prepared for an H.P.22 development (H.P.23) with leading-edge slots. This type never materialized.

H.P.22.

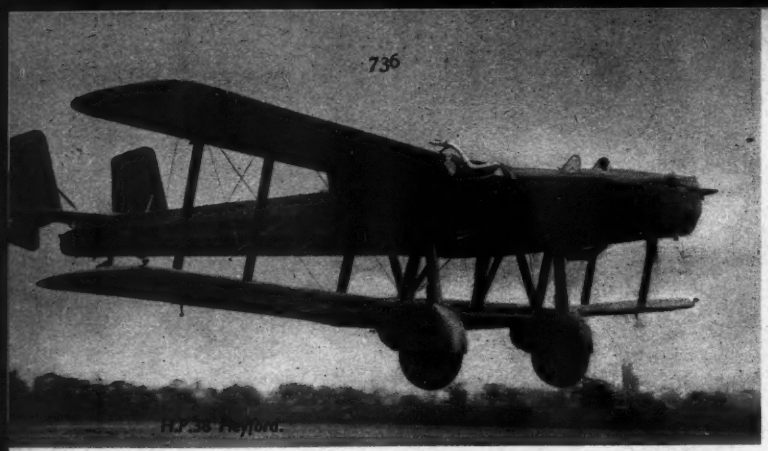
H.P.24 Hyderabad

With certain exceptions, necessitated by its military application, the Hyderabad bomber of 1923 resembled the W.8. transport. Powered by two Napier Lion engines, and weighing 12,623 lb all-up, it had a maximum speed of 109 m.p.h., climbed at 800 ft/min (the 0/400 could not better 340 ft/min), and achieved a service ceiling of 14,000 ft, against the 0/400's 8,600ft. The Hyderabad was the first large aircraft to use Handley Page slotted-wing equipment; it had automatic wing-tip slots on the outer portions of the upper mainplanes. These gave a high degree of lateral stability and the pilot had powerful and well-maintained control throughout the speed range. On the Hyderabad was performed much of the development work on the automatic slot, which relieves the pilot of any responsibility for correct opening and closing of the slots.

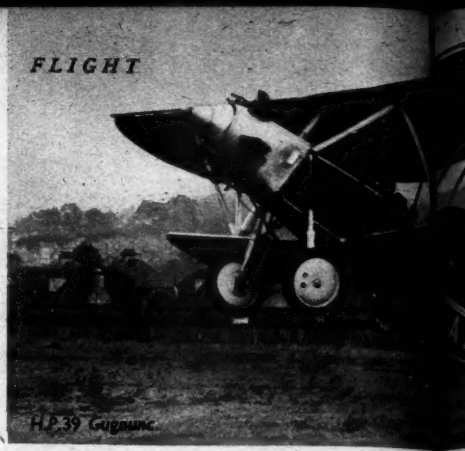
H.P.25 Hendon.

H.P.25 Hendon

Completed in June, 1924, the Hendon was a two-seater development of the Hanley, likewise having a Napier Lion engine. The speed range was from 45 m.p.h. to 108 m.p.h. and the service ceiling was 10,000ft.



H.P.38 Heyford.



H.P.39 Gugnunc.

Forty Years Famous . . .

H.P.26 Hamilton (W.8 e and f)

Two variants of this three-engined airliner, of 1924, were built —the Sabena type (W. 8e) and the W. 8f, for Imperial Airways. The design was unusual in having a large engine (Eagle) in the nose, and two smaller units (Puma) between the wings. Leading particulars: Span, 75ft 2in; gross weight, 13,000 lb; max. speed 103 m.p.h.

H.P.26 Hamilton (W.8e and f).

H.P.27 Hampstead

The fitting of three Armstrong Siddeley Jaguar engines gave the Hampstead a distinctly improved performance, when compared with its precursors. Completed in October, 1925, for Imperial Airways, it showed a maximum speed of 114 m.p.h. at 10,000ft. The span was 75ft, wing area 1,540 sq ft, and gross weight 14,500 lb.

H.P.27 Hampstead.

H.P.28 Handcross

Late in 1924 appeared an unusually large (span 60ft, gross weight 7,480 lb) single-engined day bomber, powered by a 650 h.p. Rolls-Royce Condor III engine and known as the Handcross. The top speed was 117 m.p.h. at sea level. No production order was placed.

H.P.28 Handcross.

H.P.30 (W.10)

This twin-Lion transport biplane dates from 1924. Four machines of the type, each accommodating sixteen passengers, were delivered to Imperial Airways. The span was 75ft, gross weight 13,780 lb, and disposable load 5,230 lb. At 10,000ft the top speed was 100 m.p.h.

H.P.30 (W.10).

H.P.31 Harrow

This deck-landing torpedo-bomber biplane (Napier Lion engine) was completed in 1926. In its Mk II form it had a pronounced dihedral angle on the upper wings. Two varieties of automatic slot were tried, one giving lateral stability and control at low speeds, and the other—interconnected with the slotted ailerons—functioning as a lift slot. The span was 44ft.

H.P.32 Hamlet

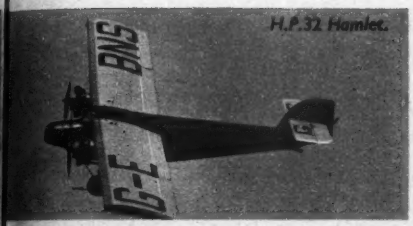
The first Handley Page commercial monoplane was the Hamlet, a comparatively small machine which could be fitted with one Bristol Jupiter engine, two Armstrong Siddeley Lynx or three Mongoose. From four to six passengers were provided for, in unusual comfort, with folding tables, electric lighting and other refinements. The twin-Lynx installation gave a top speed of 114 m.p.h. at a loaded weight of 5,000 lb.

H.P.34 Hare

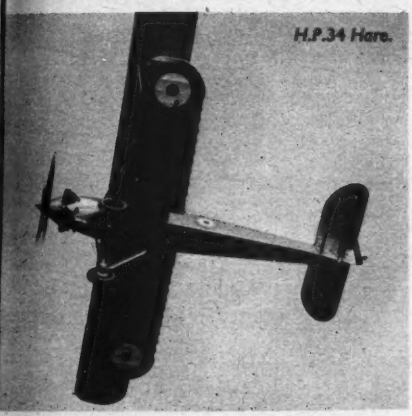
The single-engined Hare, of 1928, was characterized by the sesquiplane layout of the wings, the rigid interplane bracing, and the peculiar bracing of the split undercarriage, permitting the release of a torpedo or large bomb. The type appeared with a geared Bristol Jupiter and with an Armstrong Siddeley Panther (then known as Jaguar Major). A top speed of 145 m.p.h. was achieved.

H.P.31 Harrow.

H.P.42 and 45 (Hannibal and Heracles)



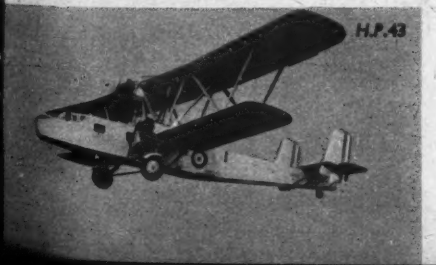
H.P.32 Hamlet.



H.P.34 Hare.

H.P.35 Clive.

H.P.36 Hinaidi II.



H.P.43

H.P.35 Clive

The first Clive bomber transport for the R.A.F. (Mk. I) was built in 1928 and was of wooden construction; a metal version (Clive Mk. II) flew in 1930. The type was designed to fulfil any of five different functions—troop, freight or petrol carrier, bomber or ambulance. With two geared Bristol Jupiter VIII engines the Clive II (14,500 lb) attained 111 m.p.h. at 4,000ft.

H.P.36 Hinaidi II

The first Hinaidi night bomber (two Jupiter engines) was actually a converted Hyderabad, and bore the type number H.P.33, but the production Hinaidi IIs of 1931-32 differed in detail and went by the type number H.P.36. As on the Hyderabad, automatic slots were fitted. Data were: Span, 75ft; gross weight 14,500 lb; disposable load, 7,260 lb; top speed, 122 m.p.h. at sea level.

H.P.38 Heyford

Named after a famous R.A.F. bomber station, this twin-Kestrel night bomber, designed along unique lines, first flew in 1933. A number of R.A.F. squadrons were later equipped. The Heyford's most striking characteristic was the placing of the fuselage under the top wing. Bombs were stowed in the lower centre section, and there were nose, dorsal and ventral gun positions—the last a rotating and retracting "dustbin." Loaded to 15,500 lb the Heyford was capable of over 140 m.p.h. Its span was 75ft and the wing area 1,420 sq ft.

H.P.39 Gugnunc

There were 27 entrants for the Guggenheim air safety competition held in the U.S.A. during 1931. Of these only two survived the tests. Both were slotted, and one was the H.P.39, later to be dubbed "Gugnunc" and to endear itself to thousands at the R.A.F. Display. This remarkable little biplane, now preserved in the Science Museum, South Kensington, had an astonishingly steep take-off angle, a top speed of 112½ m.p.h. and a minimum speed of 33½ m.p.h.

H.P.43

The wing structure of this large bomber-transport (July, 1932) resembled that of the Hannibal and Heracles class transports of Imperial Airways, but the power plant consisted of three Bristol Pegasus—instead of four Bristol Jupiter—engines. The span was 114ft, gross weight 22,500 lb, and maximum speed 118 m.p.h.

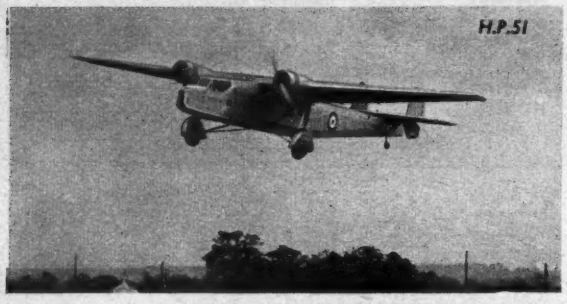
H.P.42 and 45 (Hannibal and Heracles)

Late in 1930 came the first flight of the H.P.42—a most ambitiously planned airliner with four Bristol Jupiter engines and having a span of 130ft. The Hannibal class variant was for eastern service, and the Heracles for western, on Imperial routes. Eight machines were built; some 12,000 hr flying were registered by each and their aggregate mileage (at a cruising speed of 95/105 m.p.h.) was upwards of 10 million. The take-off time was nine seconds and landing speed about 50 m.p.h. Petrol consumption was 79 gal/hr, or roughly 46 miles per passenger per gallon. These majestic old stalwarts continued in airline operation until the beginning of the war; they then embarked on a new career as military transport.

Forty Years Famous . . .

H.P.47

This boldly designed general-purpose monoplane appeared in 1935. Its scope of military usage was exceptionally wide, and slots and flaps contributed to its efficiency as a bomber, reconnaissance aircraft and torpedo dropper.



H.P.51

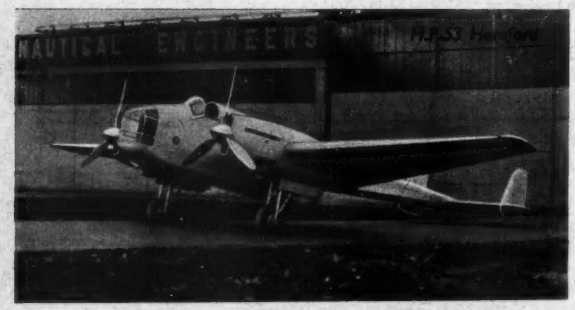
During 1935 the H.P.43 bomber transport was converted into a monoplane and restyled H.P.51. Two Armstrong Siddeley Tiger VI engines were fitted and the flying weight was 18,000 lb. The monoplane wing, which had leading-edge slots and slotted flaps, measured 90ft in span, whereas the biplane wings of the original "43" spanned 114ft.

H.P.52 (Prototype)

Designed for fast quantity production, the H.P.52, of 14,700 lb gross weight, first flew during 1936. Its appearance in the new-types park at Hendon in that year created the greatest interest. The cantilever wing was sharply tapered, slotted and flapped.

H.P.52 Hampden (Production)

The year 1938 saw the appearance of an improved version of the H.P.52 (by now known as Hampden, after the Defender of Civil Liberties). This version had Bristol Pegasus XVIII engines and was well established in R.A.F. service when war came. Hampdens attacked all parts of Germany, and in the later stages operated as Coastal Command torpedo-bombers and parachute mine layers. The gross weight of the Hampden was 18,750 lb, and its top speed, 254 m.p.h. at 15,000ft.



H.P.53 Hereford

This type was simply the Hampden powered with 24-cylinder Napier Dagger "H"-shaped engines instead of Bristol Pegasus radials. Production was undertaken by Short and Harland, Ltd., in their Belfast works, but, unlike the Hampden, the Hereford never became operational.

H.P.54 Harrow

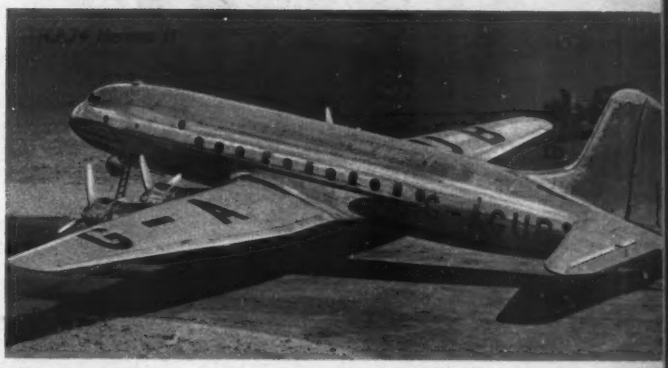
At the outset of the R.A.F.'s pre-war expansion programme a contract was placed for Harrow heavy bombers, the first example of which flew late in 1936. Two versions were produced, the Mk. I, with Pegasus X, and the Mk. II, with Pegasus XX engines. A crew of five was carried and power-driven gun turrets were fitted in nose and tail. The span was 88ft 5in, and the flying weight 23,000 lb. When Harrows ceased to function as bombers they were converted into transports and were employed in this role throughout the war. Being the only large aircraft available and able to operate from small fields, Harrows were chosen to evacuate wounded British paratroops from Arnhem.

H.P.57 Halifax

Seven weeks after the outbreak of war, in 1939, the first Halifax prototype (four R.-R. Merlins) took the air. The first production machine flew in October of the following year, and within five weeks the first Bomber Command Halifax squadron was being formed. Exactly five months after the first production aircraft flew Halifaxes made their initial operational sorties—against Kiel and Le Havre. In all, more than 6,000 Halifaxes were built and approximately 76,000 sorties were flown. The type was extensively operated by Coastal Command and was later developed for transport and glider-towing duties. Halifaxes, too, flew Allied agents deep into enemy territory and dropped arms to partisans. In civilian service modified Halifaxes, known as Haltons, have been operated by B.O.A.C., and Halifax freighters have played an important part in beating the Berlin blockade.

H.P.67 Hastings

This exceptionally fast, and very capacious, military transport is now in regular service with the R.A.F. Measuring 113ft in span and turning the scales at 75,000 lb, the Hastings cruises at speeds up to 303 m.p.h. and can function as a freighter (with internal and external loads), paratrooper, ambulance, troop transport, supply-dropper and glider tug. Jeeps and guns can be dropped by parachute. In the relief of Berlin the Hastings carries, in less than an hour, eight tons of Ruhr coal over the 210 miles from Kiel. It is also the vehicle for the R.A.F.'s biggest post-war passenger-lift from Berlin to the U.K.

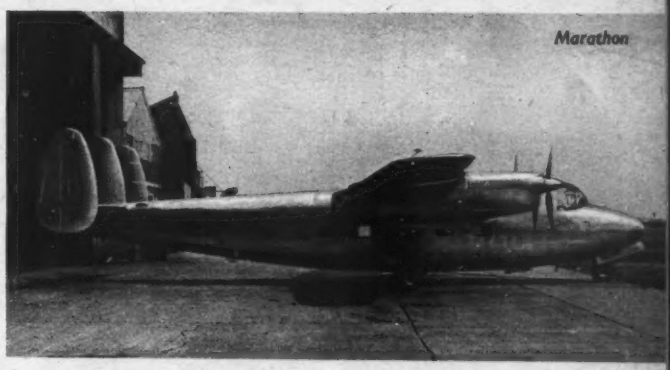


H.P.74 Hermes II

Built solely for development flying, this type is a lengthened version of the Hermes I, which corresponded in size to the Hastings, and retains the tail-down undercarriage. Four Bristol Hercules 120 engines are fitted and the cabin is pressurized.

H.P.75 Manx

The design of this experimental tailless monoplane was started in 1937, but development work was held up by the war. The first flight was made in 1944. Laid out as a pusher, with nose-wheel undercarriage, the Manx was fitted with two de Havilland Gipsy Major engines of 130 h.p. each, and provided comprehensive information on the characteristics of tailless aircraft.



H.P.81 Hermes IV

Twenty-five high-speed piston-engined airliners of this type are in production for B.O.A.C. Intended for medium/long-range work, the Hermes IV has a maximum cruising speed of 290 m.p.h., a payload of more than seven tons, an ultimate range in excess of 3,500 miles, and, for high-density medium-range operation, can carry 74 passengers. The B.O.A.C. machines will seat 40, in exceptional comfort. The engines are four Bristol Hercules 763.

H.P.82 Hermes V

In the 40-47-passenger class, this development of the piston-engined Hermes IV will be fitted with four Bristol Theseus turboprop units, delivering nearly 10,000 equivalent take-off horse-power. Two prototypes are on order and the first should be flying at the S.B.A.C. Display in September. The latest information from the makers mentions a cruising speed of 360 m.p.h. (higher than previously quoted) and a maximum range of 2,820 miles.

Handley Page Miles Marathon

At Woodley, Handley Page (Reading), Ltd., is manufacturing the Marathon four-engine feeder-line transport. Production-Marathon No. 1 should fly in the immediate future. Powered with four de Havilland Gipsy Queen geared and supercharged engines, the type has a gross weight of 18,000 lb and will cruise at 209 m.p.h. on maximum weak-mixture power. Layouts for 14, 18, 20 or 22 passengers have been planned—all with toilet and baggage accommodation. The Marathon II is a development type with two Armstrong Siddeley Mamba turboprop units.

Teams at EVERE

VISITORS ASSEMBLE FOR "FLIGHT" PHOTOGRAPHS BEFORE THE INTERNATIONAL FLYING DISPLAY DESCRIBED LAST WEEK.

1. *The Meteor team of No. 245/266 (Northern Rhodesia) Squadron.* Left to right: Plt. Il A. Nisbet, F/L. M. Scannell, A.F.C., F/L. J. A. Stephen, S/L. E. W. Wootten, D.F.C. and bar (Squadron Commander), F/L. Kempster (Engineer Officer), Plt. Il J. D. Bradley, and F/L. R. E. Windle.

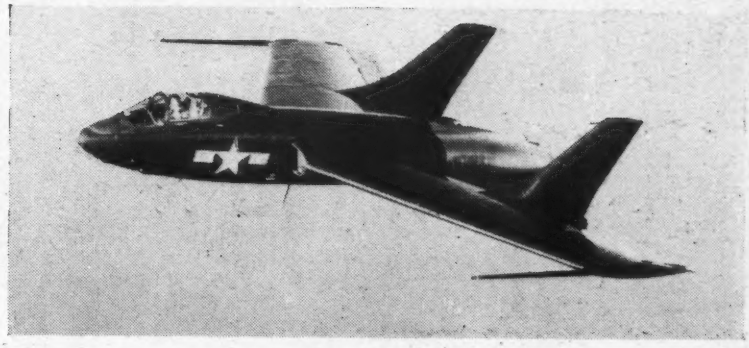
2. *Shooting Star pilots and ground crew of the 53rd Fighter Squadron, 36th Fighter Group, U.S.A.F.; the C.O. is Lt. Col. R. D. Hunziker (standing, hands folded).*

3. Maj. Van Lierde, D.F.C., briefing pilot[s] five nations on the morning before the dis[play]

4. Mustang pilots of l'Armée de l'Air.

5. Members of the Vampire team of No. 16 S[qn.] B.A.F.O. Left to right: Sgt. Southwood, Sgt. Lyons, [Sgt.] Southard, A/C. Brooks, A/C. Moore, Cpl. Dover, [Sgt.] Forrester, Plt. Ill Cosgrove, Plt. Il Moorhouse, S/L H. Le[e] D.F.C. (Squadron Commander) and F/L. R. K. Wilso[n]

HERE AND THERE



A NAVAL WEAPON: Cutlass is the appropriate name chosen for the Chance-Vought XF7U-1 naval fighter. The lines of this tailless, raked-wing aircraft appear to justify reports that maximum speed is well over 600 m.p.h. The twin Westinghouse J-34 axial turbojets are fitted with Solar afterburners. Large-scale production is likely.

Aerial Torch-bearers

MR. Arthur Drakeford, the Australian Air Minister, is reported to be examining a proposal for a round-the-world air race, via Melbourne—U.S.—Britain—Greece—Melbourne, to inaugurate the 1956 Olympic Games in Melbourne. The plan, which will be submitted to the Olympic Games Committee if thought suitable, suggests that each aircraft should collect an Olympic torch at Athens.

British Successes in Normandy

IN the Flers de l'Orne Rally of the Aero Club de Basse Normandie last week-end, a British competitor, Mr. J. Heriz-Smith (Auster Autocrat) tied with a Continental pilot for second place in the arrival competition. His navigator was Mr. J. Power and his second pilot was Dr. A. P. Thurston, of model-aircraft fame—who, incidentally, was made an honorary member of the Aerobatic Patrol of Etampes. In model-aircraft competitions held at the Rally, Mr. Walker and Dr. Thurston took first and second places in the event for reaction-motored models.

Penalty Area

The pilot of a Proctor was recently fined £8, with £5 5s costs, for landing at Ringway Airport (a control zone) to refuel. He was summoned for failing to familiarize himself with special existing rules, for not receiving prior permission to land, for not notifying the airport for air traffic clearance and for not flying under I.F.R.

Twin Centaurus Type-tested

SUCCESSFUL completion is announced of Air Registration Board type-tests of the 5,000 h.p. coupled Centaurus unit for the Bristol Brabazon I. The twin Centaurus is now the most powerful engine unit and the first "buried" installation ever to be type-tested. To simulate the flexibility and resilience of the actual aircraft wing, tests were undertaken in a reproduction of the 21ft-wide wing section. Examination of the engine mountings after the 150-hr test showed that the vibration problem had been overcome.

Flag-drag Snag

AN amusing sidelight on the "flags of five nations" event which opened the Evere meeting (described in *Flight* last week) has been revealed. During rehearsal, the Tiger Moth towing the British flag lagged sadly behind the rest of the formation; a change-round of "tugs" was made—and the same thing happened. The mystery was solved when somebody pointed out that the Union Jack had about six times as many seams as had any of the other four flags! A "specially boosted" Tiger was eventually put on to deal with the extra air resistance involved.

Jet Contestants

THE majority of British high-speed fighters and research prototypes are expected to compete for the S.B.A.C. Challenge Cup when the National Air Races are held at Elmdon Airport, Birmingham, from July 29th-August 1st. Subject to Ministry of Supply permission, Hawker Aircraft, Ltd., will enter the P.1052, to be flown by "Wimpey" Wade, and the P.1040 (Neville Duke), which will also fly in the Kemsley Challenge Trophy Race. Also competing in both the high-speed races will be a D.H. Vampire 3, flown by John Cunningham. It is hoped that John Derry, on the "108" will also represent the Hatfield firm. Gloster Aircraft, Ltd., have entered a Meteor for the S.B.A.C. race, with Rodney Dryland as pilot, while, although not yet definitely announced, it may be expected that the Supermarine 510, piloted by "Mike" Lithgow will, if possible, take part.

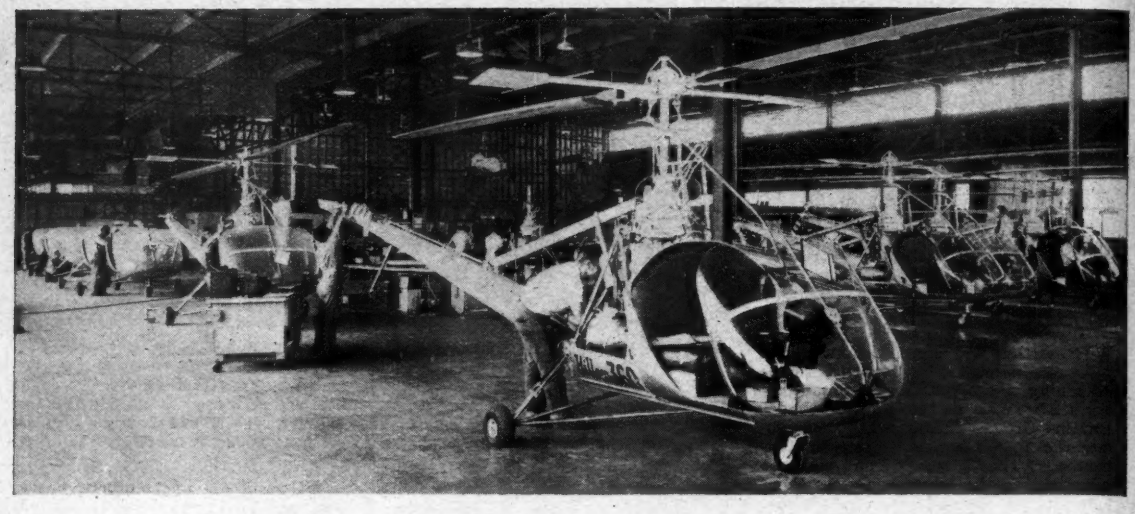
MARKSWOMEN: Seventy members of the W.R.A.F., some of whom are seen above, are taking part for the first time in the R.A.F. Small Arms Championships, which began at Bisley on June 11th and are still in progress.

Norman M. Wright

THE K.L.M. organization in this country has had the misfortune to lose two well-known members of its staff within one week. In addition to the death from heart failure (reported on p. 731) of Mr. E. C. Geary, regional operations manager, Mr. Norman M. Wright lost his life in a flying accident on June 15th. The company's flight operations officer at London Airport, Mr. Wright was also a member of No. 600 (City of London) Squadron, and it was while flying one of their Spitfires over Surrey that he was involved in a collision with another, the pilot of which escaped. Mr. Wright joined K.L.M. on his demobilization, in January, 1948, from Coastal Command, in which he had been a captain with over 1,000 hours' flying.

Speedbird Sports

TOWARDS the development of a new sports ground at Heston and the building of a pavilion, British Overseas Airways Corporation has made a loan of £7,500 to the London Speedbird Club. This was announced recently at the Club's annual general meeting by Mr. J. Thurman, the chairman. The Club has



HELICOPTER ASSEMBLY : As briefly recorded last week, production of Hiller 360 three-seat commercial helicopters at United Helicopters' plant in California has now reached three a week. This factory, shown above, employs about 125 persons, engaged mainly on assembly of main components, of which 92 per cent are produced by sub-contractors.

HERE AND THERE

a membership of over 1,000 employees of B.O.A.C., or former employees transferred to associate companies.

Life-saving Bomb

NOW in production for the U.S. Navy is an air-sea rescue bomb. On the principle that sound waves set up at varying depths between 1,500 and 4,000ft below the ocean surface will travel for thousands of miles, the "Sofar" (sound fixing and ranging) bomb is dropped into the water by a "ditched" crew, and their exact position is determined by three monitoring stations on shore. Pre-selection of the most suitable depth for detonation is made with the aid of a small ocean chart detached from the bomb, which may be set to one of six different depths in accordance with the approximate area. The U.S. Navy completed tests of the device in the Pacific in July, 1947, and reported that the detonation of such bombs dropped near the Hawaian Islands had been recorded 2,300 miles away in California.

Water-board Landings

IN his presidential address to the Institution of Water Engineers, Mr. J. Noel Wood, general manager and engineer of the Sheffield Corporation waterworks, referred to the eventual necessity of roofing-in all reservoirs. He suggested that the roofs might be made of sufficient strength to allow them to be used as alighting areas for helicopters.

Modellers' Great Day

A CLASSIC event in model aeronautics takes place next Sunday, June 26th, when the Northern Heights Model Flying Club holds its gala day at Langley airfield, by permission of Hawker Aircraft, Ltd. Beginning at 10 a.m., there will be contests for power-driven, rubber-driven, helicopters and control-line models, and the annual competition for the Queen's Cup, which this year is to be presented (at approximately 5 p.m.), by Lady Tedder. Halton apprentices will assist in running the event, which may include a display by a radio-controlled model.

Soviet Pest-purge

RUSSIAN light aircraft are being used to counter the locust menace in the Soviet Union. They are also spraying cotton fields in Central Asia, beetroot crops in the Ukraine and areas in the Crimea, Moldavia and Transcaucasia.

TO INSPECT JETS : On June 13th, after visiting Hawker Aircraft, Ltd., A.V-M. Nevill, the Chief of Staff, R.N.Z.A.F., flew to a second member of the Hawker Siddeley Group of companies — Gloster Aircraft, Ltd.—where he is seen with A. Cdre. Buckley, also R.N.Z.A.F., and (right) Mr. T. S. Wade, chief Hawker test pilot.

News in Brief

FOLLOWING a recent visit to No. 501 (City of Gloucester) Squadron, R.Aux.A.F., Mr. Arthur Henderson (Secretary of State for Air) visited Filton and inspected the Brabazon II.

* * *

Metropolitan-Vickers Electrical Co., Ltd., have transferred their London office to 1-3, St. Paul's Churchyard, London, E.C.4 (City 5757).

* * *

Mr. L. A. Sweny (manager of Marconi's aeronautical division) recently visited South Africa for consultations with the S.A.A.F. Director of Signals. Since the middle of 1946, Mr. Sweny has flown 45,000 miles on such missions.

* * *

Among the Birthday Honours (listed in *Flight* last week) was an M.B.E. for Mr. A. Thomas, chief designer (engines), Armstrong Siddeley Motors, Ltd. Commencing his career in the Rolls-Royce drawing office in 1919, he has since been associated with Wolseley, Cierva and Armstrong Siddeley design.

* * *

Travelling by air and sea, Mr. R. C. Lawes (assistant operations manager, International Aeradio, Ltd.) started a recent Far East tour by reaching Sarawak from London in 118 hours—a time which included a business stop in Karachi and a sea trip from Singapore to Kuching.

* * *

At the annual general meeting of the R.F.D. Co., Ltd., it was stated that the work of its aeronautical division had continued to expand, particularly in respect of gunnery-training apparatus and of balloons used in training paratroops in jumping practice; airline operators, too, were adopted the firm's life-jackets and dinghies in increasing quantities.

ANGLO-U.S. CONFERENCE

Viewpoints on Materials : Operating Influence on Design

AS an extension of abstracts given in preceding issues of *Flight* from papers presented by British delegates before the joint I.Ae.S.-R.Ae.S. conference lately held in New York, we here give digests of three further papers of considerable merit. Mr. A. E. Russell, B.Sc., F.R.Ae.S., chief designer (aircraft), Bristol Aeroplane Co., Ltd., spoke on *Aircraft Materials from the Designers' Point of View*, and his lecture was complemented in some degree by the paper *Materials from the Manufacturers' Point of View*, which was read by Major P. L. Teed, F.P.S., A.F.R.Ae.S., deputy chief of aeronautical research and development, Vickers-Armstrongs, Ltd. Mr. Christopher Dykes, M.A., M.Sc. (Calif.), assistant technical development director, B.O.A.C., gave a comprehensive survey of trends and the future outlook in his paper *Operating Factors affecting the Design of Future Civil Transport Aircraft.*

MATERIALS AND THE DESIGNER

By A. E. RUSSELL, B.Sc., F.R.Ae.S.

MR. RUSSELL started his discourse with the statement that, in selecting materials for use in aircraft structures, four major characteristics had to be borne in mind: (i) specific useful strength, (ii) shape and form, (iii) availability, and (iv) reliability in service. He then remarked that, when assessing the relative merits on these bases, the usual official specifications served no useful purpose other than those of identification and rough comparison.

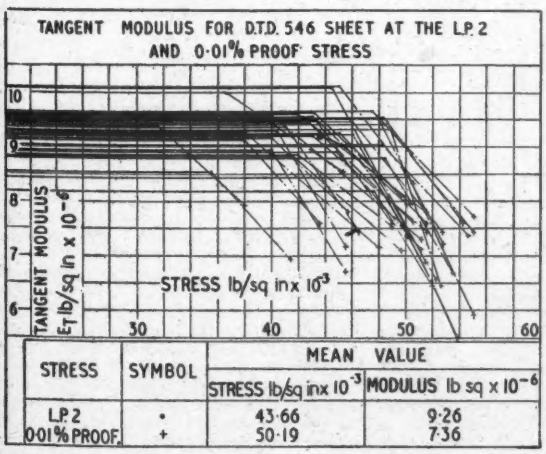
The predominant problem facing designers was to design an efficient box or tube representative of aircraft wings, bodies and tail surfaces, and the main difficulty arose in the compression surfaces, where elastic instability precipitated collapse. In the compression panels, the skin and stiffeners were liable to develop four separate types of instability, which types might be coupled to a greater or less degree. The different modes were: (i) skin buckling, which usually involved waving of the skin in a half wavelength comparable with the stiffener pitch; (ii) local instability, which generally involved displacement of the stiffener webs and flanges in a half wavelength comparable with the stiffener depth; (iii) torsional instability, where the stiffener rotated as a stiff body about a longitudinal axis in the plane of the skin; and (iv) flexural instability, in the form of simple strut instability of the skin/stiffener combination which occurred in a direction normal to the plane of the skin. In practice, the various modes might be coupled, in some cases severely, so that the instability stress was reduced. The principal couplings were local and torsional skin buckling, local torsional and torsional flexural.

The lecturer stated that the target for efficient stiffeners was to obtain the greatest possible depth whilst avoiding local or torsional instability. So far, the most efficient form known was the shape of an inverted Y, the arms mutually supporting each other at their intersections; additionally, a portion of skin completed a closed section, so providing torsional stiffness. Having established a technique for the accurate prediction of the failing load of a panel in compression, the aim of the designer was not to achieve the highest possible critical stress, but rather the least possible weight of total structure. The failing stress was inversely proportional to the square root of the "equivalent pin-centre length" and this was normally equal to the mean rib or frame spacing.

For all conditions of loading (in terms of p/l where p=compressive load, lb/in run, and l=rib pitch) the best design was determined by the modulus E of the stress at which the modulus began to fall rapidly due to plasticity. Considerable effort was needed to obtain accuracy in control testing and, claimed the lecturer, there was a double modulus (E_1 and E_2) in some alloys. It was common and pronounced in clad alloys, but was also met in unclad and even in light alloy castings.

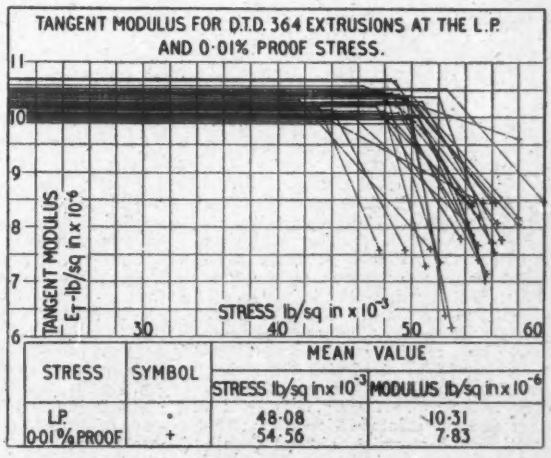
Turning to the variability of specimens taken at random from approved material, Mr. Russell instanced typical Alclad sheets in normal use, where measured values of the tangent modulus E_T plotted at the limit of proportionality and the 0.01 per cent proof stress showed that the scatter in basic elastic modulus might be as much as 10 per cent of the average value. For lightly loaded compression structures, this meant that the scatter in strength would be about 5 per cent. This was, of course, a serious matter, but when heavily loaded structures were concerned, the situation was even worse. The stress at which the E_T fell rapidly showed a scatter of nearly 25 per cent and this implied a scatter of over 10 per cent.

The magnitude of the applied design loading and the useful stress that could be developed were inter-related, and the elastic modulus was the prime characteristic determining the optimum layout of material in the structure. Under these conditions, there was nothing to come from the indiscriminate use of high-grade material, but this did not absolve the material supplier from pursuing an upward-moving proof stress. The trajectory of the stress-strain curve should be as straight and as high as possible.



STRESS	SYMBOL	MEAN VALUE	
		STRESS lb/sq in x 10^{-3}	MODULUS lb sq x 10^{-6}
L.P.2	•	43·66	9·26
0·01% PROOF	+	50·19	7·36

Fig. 1



STRESS	SYMBOL	MEAN VALUE	
		STRESS lb/sq in x 10^{-3}	MODULUS lb/sq in x 10^{-6}
L.P.	•	48·08	10·31
0·01% PROOF	+	54·56	7·83

Fig. 2

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Experience was now accumulating on the use of metal adhesives. Provided that the necessary conditions of temperature, pressure and cleanliness were maintained during the curing process, there was little doubt that the shear strength of joints at normal temperature was much superior to

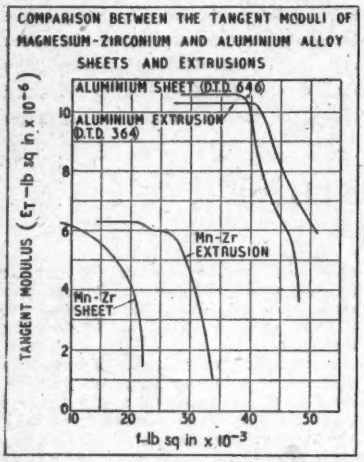

Fig. 3.

that of riveted joints. It was, however, in the secondary structure that metal adhesives offered the greatest scope. The necessary conditions were more easily achieved by sticking a very light corrugated backing to a thin skin. For this purpose, skin of the order of 0.012in thickness was required, and it would be an advantage if such skin were obtainable in sheet instead of strip form.

In addition to the application of adhesives in direct metal-to-metal connections, many structural designers had been attracted towards a form of construction in which metal sheets were separated and stabilized by an ultra-light core to which they were stuck. The problem of developing an ultra-light core and a face bond satisfactory for the separating stresses encountered was no easy one. Many materials had been tried but the right material had not yet been found.

On the subject of dimensional variability, Mr. Russell observed that care should be taken to ensure that unintentional weight did not creep in unseen; with the order of thicknesses involved in aircraft structures, 0.001in excess was an appreciable percentage. He then gave some examples of measurements made on some 3,000 sheets of various sizes, from which it emerged that the random scatter of thickness averaged 6 to 7 per cent above nominal. This had led to the adoption of direct weight control, by means of which the excess mean weight had been reduced to less than 1 per cent. In a certain large aircraft using some 40,000 lb of sheet, the gain was most significant.

In the case of extrusions, the standard official specifications embodied bilateral tolerance systems, the great weakness of which was that, if a skin was closely designed to a critical buckling stress, any percentage reduction of thickness caused three times that percentage reduction in strength, once for the reduction in area and twice for the reduced buckling stress. Mr. Russell again quoted his experience of agreement with a manufacturer where minimum thickness as shown on the drawing and unilateral tolerance positive and equal to half the total specification value were postulated. This resulted in a saving of 5 per cent of all extrusion weight, equivalent to one-third of 1 per cent of the aircraft all-up weight.

Property Variability

Knowledge of the variation in physical characteristics with orientation relative to the major axis of the material was frequently bought by bitter experience. The problem was extremely complex and could be confused by the presence of locked-up stresses residual from the original material manufacture and by stresses introduced by further manipulation. The subject was of much importance on account of the trouble it could cause, and Mr. Russell instanced some typical examples. It could be concluded that the main features in the design of parts machined from forgings, shapes and bars, should be to (i) reduce all stress concentrations to a minimum; (ii) avoid rapid changes of section; (iii) make best use of the directional qualities; and (iv) ensure proper heat treatment during manufacture.

Giving what he described as being little more than an expression of the uncertain nature of the problem of fatigue, the lecturer stated that evidence available from flight research suggested that the wing structure oscillated more or less continuously at its fundamental frequency; the fluctuating stress varied for different aircraft, but was usually less than ± 10 per cent of the mean stress. Fatigue failures in structural elements for which the trouble had been traced to an uncomplicated primary cause were indeed scarce. Where failures had been found, they had been the direct result of unsuitable detail design.

Mr. Russell gave some examples of the use of fatigue testing as a discriminator to establish desirable methods of manufacture which, however, soon developed into an investigation on a particular issue. The results were presented without illusion as to their intrinsic value, but rather as an example of an incomplete effort made to obtain a comprehensive relationship between the results of

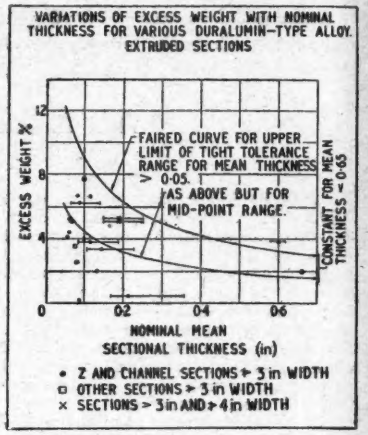

Fig. 4.

tests on round polished bars with those of representative structural forms.

The striking feature of the results was the alarming discrepancies between the critical stresses for Z-shapes and polished round bar. There was a consistent and rapid fall after 10^4 cycles. The tests included widely differing end supports and methods of manufacture, and also four different test machines, but the results of tests on polished round bars in the same material would lead one to suspect a malignant influence by the shape of the section. Until these results could satisfactorily be sorted out, several interpretations were possible, the two most obvious being a too facile acceptance of polished bar results as a criterion for direct design use, and the other against an unqualified acceptance of testing technique. Even with these doubts, however, the lecturer thought that fatigue testing was a very useful design discriminator and strongly advocated a continuous programme of *ad hoc* work.

MATERIALS AND THE MANUFACTURER

By MAJOR P. L. TEED, F.P.S., A.F.R.Ae.S

MAJOR P. LITHERLAND TEED introduced his paper with the observation that, from the point of view of national security, there might be few, cognisant of the past, who failed to realize the importance of aircraft production in the future. It might not, however, be equally appreciated how relatively unimportant from a commercial point of view the aircraft industry might be in the present to the manufacturers of materials.

From many points of view, the present position with regard to aircraft metallic materials was unsatisfactory. There were too many and all too little was known about them. The designer was confused by the multiplicity of specifications which gave him but the barest indication of a few of the *static* mechanical properties of the alloys to which they related. Further, he could not expect to derive any considerable addition to this meagre information either from the alloy manufacturer or from any authoritative work of reference. His position was an unenviable one, for he was called upon to design a dynamically-loaded mechanism on the basis of a scanty knowledge of a very few *static* properties. These, at best, had been determined *only at normal temperature*, although the aircraft might well be expected to attain stratospheric heights and, as likely as not, be thermally deiced.

The keystone of good aircraft structural design was surely a capacity to produce the lightest possible joints capable of functioning effectively for the planned lifetime of the unit of which they were components. This, for certain classes of aircraft, could be taken as being of the order of 20,000 flying hours. Joints were zones of stress concentration. They were dynamically-loaded and in the three operations, take-off, flight and landing, were subjected to an unknown

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number of complex stress reversals.

The use of clad aluminium alloy sheets had virtually eliminated corrosion troubles in these thin materials, but there were certain aspects unfavourable to the extensive use of clad sheet in war-time. Since the cladding was virtually without mechanical strength, and usually constituted some 8 per cent of the total sheet thickness, its omission would allow of an appreciable weight-saving or, if the same gauge were used, of a certain increase in strength. The necessity of using an organic protective would substantially reduce the direct weight-saving but, nevertheless, in time of war, when aircraft life was unfortunately short, it was strongly to be doubted whether the use of clad sheet was operationally desirable.

On the subject of the change in properties of metals at stratospheric heights, Major Teed observed that, for the wrought and cast aluminium alloys used in aircraft construction, there were small increases in Yield and Ultimate Stresses, generally of the order of 3 to 5 per cent. With Aluminium-Magnesium alloys, these gains were somewhat greater. The Young's Moduli of the common aluminium alloys, whether wrought or cast, rose about 5 per cent on their being cooled to about −112 deg F. There were exceptions to this rule as exemplified by modified wrought Aluminium-Silicon eutectic alloy, the Young's Modulus of which was at a maximum at about zero F and then fell rather rapidly to at least about −300 deg F.

Although knowledge of the mechanical properties of magnesium alloys was disappointingly small, it could, however, be said, at temperatures well within the stratospheric range, such cast and wrought magnesium alloys as had been examined suffered no dramatic or irreversible changes either in static or dynamic properties.

By the exercise of a combination of metallurgical methods, mild steel could be produced with a temperature of transition from tensile to brittle fracture much lower than would be the case were these techniques not employed. It was, however, virtually impossible to prevent this dangerous change from starting above −76 deg F, and this made the use of such steels unsuitable for high-altitude aircraft.

The third part of the lecture was devoted to an examination of fatigue. The lecturer stated that, on the authority of those engaged in their investigation, the causes of failure of aircraft parts in Great Britain showed that about 75 per cent could definitely be attributed to fatigue. When a small stress lower than the elastic limit of the material was applied to a specimen, subsequent micro-examination generally showed that slip planes had developed within a relatively few crystals, i.e., some plastic yielding had taken place. The specimen as a whole had not been stresed beyond its elastic limit, but a few individual grains had undergone permanent deformation. *This was a pre-requisite of fatigue failure.* After such plastic deformation, failure was not inevitable, but without it, it would not take place.

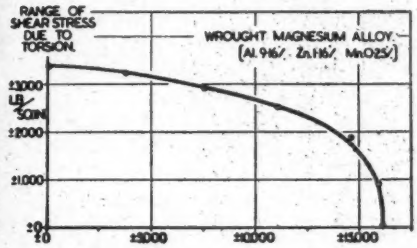

Fig. 1 (left). Combined torsion and bending endurance tests of magnesium alloy forging (10^8 cycles).

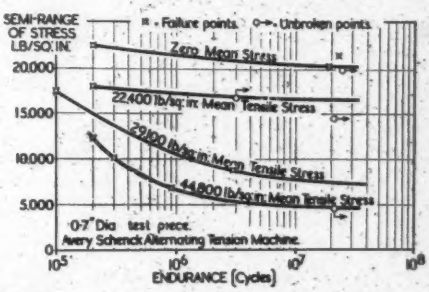

Fig. 2 (right). Influence of mean stress on endurance limit of extruded D.T.D. 354 polished bar.

Fatigue Limit

Certain metals, in particular iron and the ferrous alloys, had under certain conditions, a fatigue limit, i.e., they were capable of withstanding an infinite number of stress reversals provided always that the maximum stress did not exceed a certain figure. Some metals and alloys, however, apparently had no such limits. An explanation of this anomaly lay in the respective capacities of the metals to provide local stress relief by way of plastic deformation. Whilst neither aluminium nor its alloys were regarded as having a true fatigue limit, there were marked differences in the measure in which different groups of alloys fell short of possessing one.

Major Teed thought that, in certain cases (in which the ferrous alloys were outstanding) under-stressing could be used to increase the original fatigue limit of the material. He gave an example in which the endurance limit had been increased by about 30 per cent. Something had also to be said with regard to the influence of over-stressing on the fatigue or endurance limit, and an example was quoted in which a 17 S.T. rolled rod having an endurance limit of 18,500 lb/sq in, when subjected to four periods of increasing over-stress, starting at 19,900 lb/sq in, subsequently withstood approximately 32 million stress reversals at 22,000 lb/sq in, despite its life from the normal S/N curve at this stress being but 24 million.

Fatigue failure had often been described as being due to tension stresses; this was less than a true picture for, whilst in the majority of failures tension stress was the main cause, the breaking of bolts and rivets under alternating shear was by no means unknown, and failure in an over-loaded ball-bearing usually originated from a cyclic shear stress. Much had been explained as being due to the inequality of stress distribution arising from random orientation of similar crystals, but the lecturer thought that much more could be attributed to the structure of the alloys which, without hesitation or misgiving, the engineer used. The complexity of an alloy structure, however beneficial it might be in developing desirable mechanical properties for dealing with static loads, was not always correspondingly advantageous for resisting fatigue.

The type of apparatus employed to determine the fatigue characteristics unfortunately influenced the results obtained. Major Teed believed that, without exception, figures derived from a rotating beam machine indicated a higher resistance to fatigue than would be the case were the test made with an alternating tension machine. Even with the same sort of test gear, there was often a considerable size effect. Thus, not only was there no absolute measure of fatigue, but the relative resistance of different materials could only be stated in respect of tests made with the same type of machine, using specimens of the same size, subjected to the same stress cycle, for the same number of reversals.

OPERATING FACTORS AND DESIGN

By CHRISTOPHER DYKES, M.A., M.Sc. (Calif.)

INTRODUCING his paper, Mr. Dykes said that commercial requirements were the basis for design and would thus be treated first. New factors likely to arise were those associated with increased speed and operating height. Higher block-to-block speeds, though a competitive advantage to the operator, did not necessarily increase the amount of work for which the aircraft could be used for a given period of the day. This could be done only by increasing the number of flights or the length of the route—both of which methods were limited by the habits of the travelling public, to whom arrivals and departures outside normal hours were acceptable only at cut rates. The return for any increase in cruising speed must therefore be examined separately for each route.

After analysing the application of the first method to the London-Paris route, the lecturer concluded that, to use an aircraft for four return trips during a convenient working day, instead of three return trips as at present, cruising speed would have to be increased from 235 m.p.h. to 420 m.p.h. Returns from a lesser increase in cruising speed would be solely competitive—at the expense of greater operating costs.

A summary of the results of operating faster aircraft between London and New York suggested that (i) above 350 m.p.h. sleeper layouts would be uneconomical, since they would be required in one

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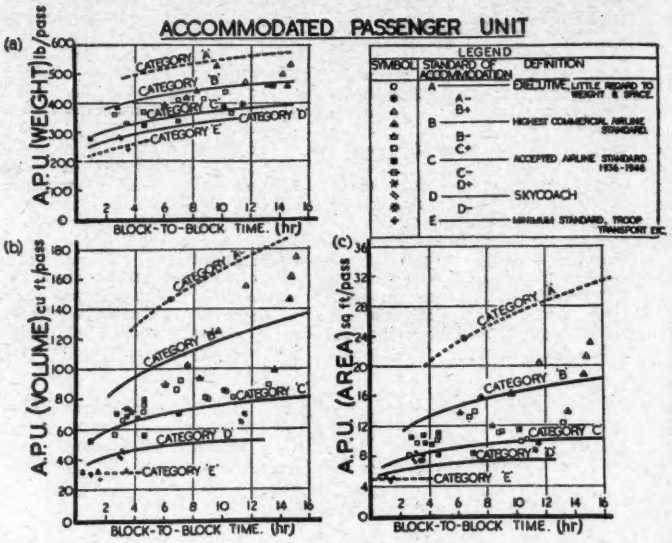


Fig. 1. Accommodated passenger units, showing variation of factors of passenger weight and space accommodation with block-to-block time for different standards of comfort: (a) total weight per passenger including personal weight, baggage, consumable stores and furnishings; (b) total volume per passenger including cabin, lounge, galley, dressing rooms, and toilets; (c) Total floor area per passenger, on same basis as (b). The following passenger and baggage allowances per passenger are made :—

Category	A	B	C	D	E
Personal and hand baggage weight (lb)	165	165	165	165	165
Consumable stores weight (lb)	9	9	9	6	3
Heavy baggage weight (lb) ...	66	66	66	44	22
Heavy baggage volume (cu ft)	5.5	5.5	5.5	3.7	1.8

direction only; (ii) up to 450 m.p.h., eastbound services must stop at Gander, or be operated with double crews, and the required payload-range combination must be adjusted accordingly; (iii) a further increase to 500 m.p.h. would yield a substantial return in improved frequency of schedule. Several consecutive trips with the same aircraft would be possible; (iv) above 550 m.p.h. every effort should be made to extend range sufficiently to permit direct London-New York flights with satisfactory payload in order to take advantage of the complete elimination of slip crews.

On the U.K.-Near East route to Egypt, a 100 m.p.h. increase would best be turned into useful work by extending the service to cover the Iranian oil traffic, and possibly to India and Pakistan. Timetables on both directions of the London-Australia route would be practicably improved by cruising speed increases, but operational limitations would occasionally prevent full advantage being taken of the higher speeds.

Discussing riding comfort, the lecturer forecast that the use of turbine-powered aircraft would accentuate the effects of "dry-front" turbulence, due to the economic necessity of flying at or near optimum altitude. Cloud-collision warning radar would be essential for high-speed aircraft.

In Fig. 1 are shown methods of assessing the relative potentialities of new aircraft with regard to passenger accommodation. Weight, cabin volume and floor area are plotted against trip time per stage to give an "accommodated passenger unit" for each of these factors. Provision is made for passengers, passenger service in the air, and baggage. Five grades of comfort are considered. For the optimum combination of mail, passengers and freight, standard "D" was thought to be the best compromise, although on long weight-limited sectors only if a substantial gain in load factor were possible. Mail, passenger and freight combinations, and standards of mail and freight accommodation were discussed at some length.

Turning to meteorological limitations likely to be encountered by future aircraft, the lecturer reviewed the characteristics of high altitude winds, and suggested that with increased operating heights the North Atlantic route, at present the most arduous, would probably present less difficulty than many Asiatic sectors. Ambient air temperature at high altitude was, with the employment of gas turbines, likely to prove a major variable in the future. To reduce range losses, compressor ratios for both turboprops and turbojets powering aircraft operating in the tropics were likely to settle in the region of 8: 1. Standard atmospheres defined in Airworthiness Standards, plotted against estimates of the operating temperature range, are shown in Fig. 2. Humidity was unlikely to introduce new problems, other than those of cabin humidification for pressurized aircraft.

In the course of a review of problems set up by air traffic and airport control, it was suggested that stacking at 20,000ft, and an increase to six, or even eight, power units (to permit one or more to be shut down during the waiting period), would be necessary measures. Almost entirely automatic landings, avoiding a second circuit, would be essential; it was further suggested that special passenger transport coaches to the aircraft—stationed at an allotted point on the perimeter track—or, alternatively, special towing trucks be provided to obviate heavy fuel consumption in taxying.

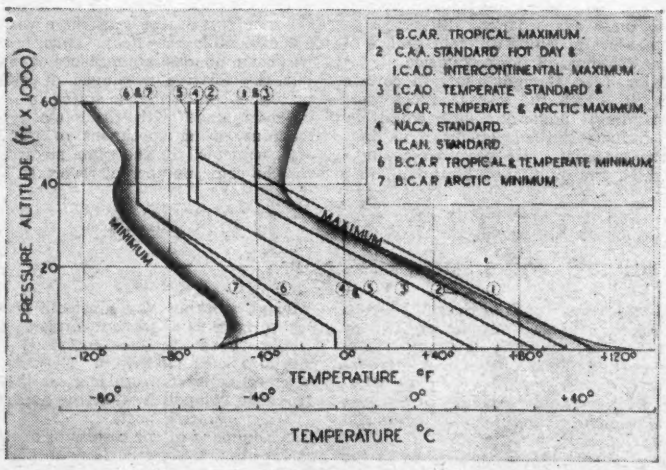


Fig. 2. Variation of ambient-air operating range with pressure altitude, showing relation to various international and national "standard atmospheres."

Runway Loading

Runway bearing strength, owing to the increasing weight of aircraft, was a subject of great importance, requiring close study. B.O.A.C. recently collaborated with a British firm of constructional engineers to produce a runway loading index to represent the effect of the aircraft on the runway and indicate liability to failure. The lecturer defined this index in detail, and stated that, although it was derived from theoretical considerations, it should provide useful data on runway failure. Two maintenance problems raised were those of pressure testing, which was time-consuming and would require a built-in compressed-air supply; and of gas turbine bench-testing. The cost involved by the latter would possibly cause all overhaul work to be sub-contracted to manufacturers or specialized firms, with a consequent decrease in the number of airline engine shops.

An exhaustive survey was made of operational cruise control, because of its fundamentally important bearing on operating economy, and therefore on aircraft design. Before suggesting pro-

Anglo-U.S. Conference . . . . .

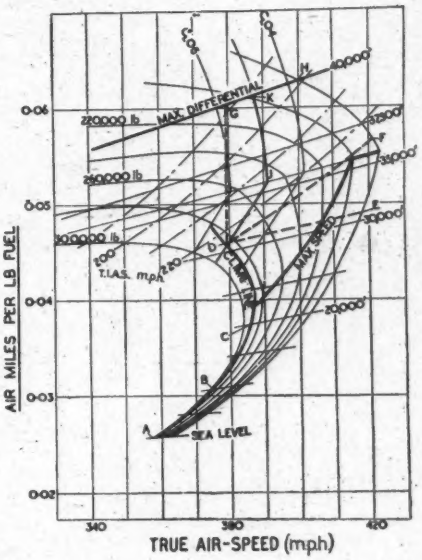


Fig. 3. Typical air-miles-per-pound "grid" for gas-turbine-engined aircraft, showing variation with gross weight, air speed and pressure altitude for a constant turbine r.p.m. Note that the "climb line" A, B, C, D (which gives the relation between instantaneous gross weight and altitude during a climb at the optimum climbing speed using the same r.p.m. and starting at the maximum gross weight) must not be related to the corresponding air speed shown on the grid. Line DE corresponds to a constant altitude cruise control procedure; DF corresponds to a constant indicated air speed cruising control procedure; DJK corresponds to a constant angle of attack cruise control procedure; and line DG corresponds to a constant true-air-speed cruise-control procedure.

cedure for cruise control with gas turbine-powered airliners, the lecturer outlined the present grid chart system for piston-engined aircraft from which such procedures are calculated. For future aircraft, the most useful type of chart retained the same variables—altitude, engine power, air speed and aircraft weight—but their order of importance differed. Fuel consumption per pound of thrust for a turbojet, or per shaft horsepower for a turboprop, increased rapidly with a decrease in engine speed, and it could be shown that, to obtain most air miles per pound, gas turbine-powered aircraft should be operated with as high compressor r.p.m. as was compatible with turbine limitations. B.O.A.C. had, in fact, pioneered a type of grid (Fig. 3) in which altitude had been used as one of the variables, and turbine r.p.m. relegated to a secondary role.

Operating Limits

Limits marking the "operating area" were shown to be: maximum altitude permissible with the limiting cabin pressure differential; the locus of maximum speed at each weight—a limit which might be varied on turbojet aircraft by Mach number or by aerolastic effects on raked-wing designs; the climb line, a superimposed curve giving the relationship between weight and altitude. The fourth limit could not be determined until actual experience of such operations was available, but it appeared likely that it would be some distance to the right (i.e., faster) of the line of theoretical maximum economy. The type of grid shown in Fig. 3 would be found to have many practical advantages, allowing the effect of different methods of cruise control to be ascertained almost at a glance.

Due to unexpected difficulties in the development of accurate true air-speed indicators, it had been necessary to evolve a new cruise control procedure. It now appeared that cruise control based on maximum lift coefficient would offer substantial gains in economy over constant indicated air-speed procedure, at slight cost in average speed. Such a procedure corresponded closely with a constant potential rate of climb.

Because of the characteristic decrease in power with decrease in forward speed during the cruising range of gas turbine transports (particularly with turbojets) it was essential that changes in cruise control should be effected smoothly to prevent failure to achieve the performance theoretically possible. In this respect, Mr. J. D. G. Stevenson, of B.O.A.C., had suggested that if the pick-off points, or the fore-and-aft zero of the automatic pilot were displaced by a relatively small angular movement, the aircraft would be held almost continuously in a condition of climb at a constant angle of attack, and thus of the desired constant lift coefficient. The suggestion was likely to receive much attention in the future.

With the extensive use of gas turbines, it was concluded, drastic revision of existing flight control methods would be necessary, since acceptable economy could only be attained if the optimum flight plan were followed, and if any diversion from primary destination were made on the optimum diversionary flight plan.

On the question of route analysis—the process of preparing hypothetical flight plans for average aircraft operating under carefully selected typical conditions—the lecturer stressed the importance of close study by manufacturers, so that aircraft should fit the routes for which they were individually intended. In the making of this analysis, problems would be encountered in the estimation of fuel allowances, and reserves. The main allowances were: climb to initial cruising altitude, during which a limitation might be imposed by the need to maintain cabin pressure below the maximum rate of change; and descent, which raised questions affecting both passenger comfort and structural condition. Solutions to the latter might be found in the use of dive-brakes, specially stressed undercarriages, or, for turboprop transports, reversible pitch airscrews.

In estimating fuel reserves, it was advisable to base stand-off, diversion to alternate airport and final (fuel undrained from the tanks) reserves on records of actual wind encountered. Route analysis should clearly be capable of calculating fuel reserves required to cover forecast error on the latest forecast of headwind available before flight. The two present methods of estimating the latter were discussed: the "fixed sector" system (applicable to short or medium haul operations, where payload capacity exceeds maximum payload which can be stowed; routes on which day-to-day conditions differ negligibly; and sectors on which forecasting is unreliable); and the "minimum payload" system (for routes where there is a large discrepancy between long-term forecasts and daily winds). New factors affecting these methods received close attention, notably the employment of the "ogive" form of plotting the likely incidence of headwinds and the effects of increased operating altitudes and pressure-pattern flying. It was observed that manufacturers' design offices should be in a position to undertake route analysis calculations when the necessary route information had been obtained.

Summing up, Mr. Dykes gave a brief discussion of probable changes in design. Engine development was likely to be towards greater reliability and greater consistency in operation; requirements for civil and military gas turbines were likely to converge. The effect of ambient air temperature on the power of these units was likely to cause a revision in the method of rating, permitting temperature to vary the operating r.p.m. limits, and would also demand close study of the choice of optimum compression ratio. Low consumption at powers down to 50 per cent was very necessary, and development of turboprops with a wider r.p.m. operating range was desirable. Aerodynamically, slower descent and better approach characteristics were likely to compel more attention than the development of high lift flaps, as landing speeds were likely to be considerably slower.

Suggested Design-Rules

In engineering design, there would be greater use of fully interchangeable "packaged units"; automatic air conditioning systems; fewer fuel tanks—or more pumps to transfer fuel remaining; instruments constructed, for the first time, to civil standards; minimum crew numbers—navigators and engineers being eliminated; automatic pilots for all stages of flight; and more undercarriage wheels of smaller diameter, but higher pressure. Suggested general design rules were that aircraft should fit the task to be performed in all conditions, and that payload-range characteristics should always relate to the critical sector of the intended route, although not to the worst conditions on that route. In this connection, routes with a strong prevailing wind in one direction would inevitably demand a compromise in the estimation of payload. Tankage should be sufficient for over-flying any airport on the route, even at the cost of payload. Engine design should be geared to that of the aircraft.

In conclusion, the lecturer said that the numbers of aircraft would be much smaller than had been supposed—fleets of over 100 would be unusual—so that civil air transport would always be set apart from large-scale production. If the industry was to prosper, there must be complete marriage of the minds of the manufacturer and operator. For one to work without the other was bound to lead to a diminution of the small profit margin which was all that could be seen at present.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

A NATIONAL AERONAUTICAL MUSEUM?

"Materials . . . in Abundance"

I AM indebted to Mr. Dennis Powell for his letter in your issue of June 2nd in which he corrected my statement that no large-scale attempt had been made anywhere in the world to preserve items relating to aeronautical history. In the process of taking me to task he gave first-hand information concerning efforts which have been made in that direction in the U.S.A. As a corollary to that information I read in *Flight* on June 9th that the Superfortress which dropped the first atomic bomb is to be preserved in the National Air Museum, Washington.

I think it is safe to say that a few decades hence the visitor to the N.A.M. will be concerned less with the achievement than with the aircraft *as a type*. The point is that the Americans possess organizations which keep pace with their aeronautical developments side by side with literary and photographic collections of inestimable value.

Here in the British Isles we have nothing.

Since my appeal in your issue of May 12th I have heard from many people who are eager to see a similar museum launched. I have also learned of private collectors who have been purchasing and preserving aircraft and records as a labour of love—unable to find adequate premises or any kind of official support. There is little doubt that the materials for a *British* National Air Museum are here in abundance, together with people having sufficient knowledge and enthusiasm to institute it.

It is, perhaps, not appreciated that when the last air pioneer and the last eye-witness are gone there will be nothing left but the written word. The time has come to collect all surviving relics—in a small way to begin with, but gradually building up as exhibits and records are assembled. Being over-ambitious will achieve nothing, but a start of some kind *should be made without delay*.

I shall be pleased to hear from anyone who is interested in such a scheme and I will answer all queries—addressed to me at 50, Lovett Road, Copnor, Portsmouth—from those who missed my original letter. D. S. GRIFFIN.

Portsmouth, Hants.

RAMJETS

How—and Why—They Work

THE problem raised by Mr. D. Smith (June 9th) of the point of application of thrust within a gas turbine or ramjet is simply understood if one remembers that thrust derives from the back pressure required to expel the exhaust gases. In the turbine the gas pressure is initially raised by the mechanical compressor and then progressively falls across the combustion chambers, turbine and exhaust pipe. Most of the thrust is thus taken at the compressor outlet; this, on a centrifugal type, will be the diffuser elbows, and on an axial type the final ring of stator blades.

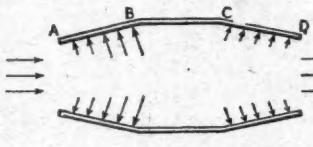
The thrust force will, of course, depend not only on the pressure but on the area upon which it acts. Hence comparatively low pressures in the exhaust cone may create considerable extra thrust by reacting on the turbine fairing cone.

In the ramjet or athodyd compression also takes place, this time by the conversion of kinetic into pressure energy at the divergent entry nozzle. The pressure then remains more or less constant across the combustion range and drops back to atmospheric at the tapered duct outlet. A ramjet is not, of course, simply "a plain tube," but is rather of streamlined shape, the inside curvature of the entry being the reaction point from which the gases "push themselves out."

Christchurch, Hants. R. A. FRY, A.M.S.L.A.E.

Not "Just a Tube"

IN reply to your reader Mr. D. Smith (*Flight*, June 9th), the ramjet is not "just a tube." It is shaped as in the sketch.



The increasing pressure of the air in the diffuser A to B is greater than the pressure of the jet accelerating out of the tail-pipe C to D. The difference in the horizontal components of these pressures is the thrust. In the turbojet, the thrust is applied in a similar manner, in the combustion chambers, plus "lift" from the blades of the impeller.

Leicester. ROGER TENNANT.

Try Roller Skates . . .

IF you, on a frictionless trolley, are a mass M, and you throw away a mass m at a speed s, then by Newton's laws you move in the opposite direction at a speed Y, depending on M, m and s. If M and m remain constant, but you throw away faster, say at $s+$, you move in the opposite direction at, say, $Y+$.

All a jet does is to take in a mass m of air and throw it out at a speed s, "combusting" paraffin or what-not to do the throwing. There is no "punt-pole" effect save as an accident due to the presence of atmosphere. If you supported yourself by a jet downwards (instead of planing in air), and had also a horizontal jet, then by the mere speed of throwing away the mass of exhaust gases (burnt fuel), you could fly in a vacuum.

Try standing on roller skates on a good runway and putting the weight. J. E. T. TYDYNE.

London, S.W.1.

[We trust that the reader who raised the original query, and other readers interested, are content with the above explanations; additionally, we would refer them to the Correspondence columns of *Flight* for January 20th and February 3rd, 10th and 17th, 1949, when the same subject was discussed at some length.—ED.]

HISTORY OF No. 2 SQUADRON

Addition to List of C.O.s

YOUR article (June 9th) on the history of No. 2 Squadron was most enjoyable. It is unfortunate, however, that, having gone to the trouble of giving a list of commanding officers in chronological order, you should have omitted the name of S/L. M. J. Gray, D.F.C., who preceded S/L. Maitland. D. A. CLIFTON-MOGG,

(Ex-Flight Commander, No. 2 Squadron).

London Airport.

FORTHCOMING EVENTS

June 22nd to 24th.—Institute of Transport; Congress at Buxton.
June 26th.—Northern Heights Model Flying Club; Gala Day, Hawker Airfield, Langley, Bucks.
June 26th to July 3rd.—Aero Club d'Italia; International Air Week, Milan.
June 26th.—Grande Fete de l'Air, Lausanne, Switzerland.
July 1st.—R.A.F. Golfing Society; Summer Meeting at Moor Park Club, Herts.
July 2nd.—R.N. Air Station, Lossiemouth; "Open Day" and Flying Display.
July 2nd to 4th.—Royal Aero Club; Private Air Rally at Deauville. Guests of M. André.
July 2nd to 10th.—Tour de France Aérien.
July 2nd and 3rd.—Aero Club de l'Orne; Rallye du Point d'Alençon.
July 4th to 11th.—Royal Aero Club; Private Air Rally to Spain.
July 9th.—Royal Naval Air Station, Culham, Oxford; Air Display.
July 9th.—Redhill Flying Club: Garden Party.
July 10th.—Auster Flying Club; Air Display at Rearsby Airfield.
July 16th.—Royal Naval Air Station, Anthorn, Kirkbridge, Carlisle; Navy Day.
July 16th and 17th.—Royal Aero Club; Private Air Rally at La Baule, S. Nazaire. Guests of Mme. André.
July 17th.—Cowes Aero Club; Air Display.
July 23rd.—"Daily Express" Air Pageant, Gatwick Airport.
July 30th to Aug. 1st.—King's Cup Race and National Air Races, Elmdon Airport, Birmingham.
Aug. 6th.—Southend Flying School: Flying Meeting and Air Display.
Aug. 19th to 26th.—British Gliding Association: National Gliding Contests, Gt. Hucklow, Derbyshire.
Aug. 21st.—Wiltshire Flying Club and Royal Artillery Flying Club: Thruxton Air Races.
Aug. 28th.—Cowes Aero Club: Air Display.
Sept. 6th to 8th.—R.A.F. Golfing Society: Autumn Meeting and Ladies' Section Championship at Walton Heath Golf Club.
Sept. 7th to 11th.—S.B.A.C. Annual Flying Display and Exhibition, Farnborough.
Sept. 7th.—R.Ae.S. (Luton): "Air Liner Operation."
Sept. 12th to 18th.—Battle of Britain Week. R.A.F. "At Home" day, Sept. 17th.

SERVICE AVIATION

Royal Air Force and Naval Aviation News and Announcements

R.A.F. and the Tournament

ROYAL AIR FORCE participants in the 1949 Royal Tournament, at Olympia, London, which was opened by Field Marshal Sir William Slim on June 16th, and remains open until July 2nd, have received acclaim for their contribution to a most memorable programme. In a display where the rich pageantry of the past makes a refreshing reappearance alongside the precise mechanism of modern military equipment, individual preference tends to prevent a fair assessment of honours due. But two newspaper headlines ("Para-girls are hit of the Tournament" and "Police dogs steal the show") are proof enough that the R.A.F.—a Service which was necessarily denied a demonstration of its most spectacular components—judged well what was called for by the occasion, and met it accordingly.

Olympia itself was a study in colour, even before the programme was first seen by an audience—at the private showing on June 15th. Suspended above the arena, against a sky-blue backcloth, were silver balloons and parachute canopies in a variety of gay shades, while the audience itself contributed unconsciously to the effect: a crimson square of Chelsea Pensioners, with the colours of school, Service, and cadet uniforms likewise grouped in orderly contrast.

Alsatian police dogs from R.A.F. Staverton, under the precise and authoritative control expected of the Provost Branch, showed by a combination of speed, strength and sagacity that, with these watch-dogs on guard, no fears may be held for the security of lonely airfields. Recalling the length of time available, we must record the Transport Command exposition of parachute training methods as being not only revealing, but a model of showmanship.

Within a comparatively small arena, we saw practice ground falls by trainee instructors (48 men who moved as one), dummy landings after a rushing travel down an inclined cable, simulated descents from balloon cages, and 105ft jumps from the roof with opened, controlled parachutes. This joint item, representing fulfilment of the work of R.A.F. instructors and representative pupils, caught public attention with the inclusion of two "Wrafs"—a nursing sister, and a nursing orderly. And finally, there should be mention of the R.A.F. physical training instructors, who, with colleagues from the other Services, gave a brilliant and breath-taking display of gymnastics.

"Flight" photograph.

SUNNY DEVON: Bright lighting and a speedy fly-past by the R.A.F.'s latest communications aircraft produced this pleasant impression from No. 610 (County of Chester) Squadron's recent display at Hooton Park.

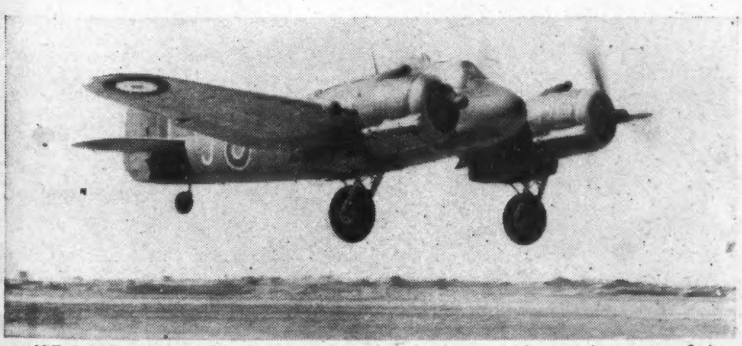
New R.A.F. Records Chief

UNTIL recently the commanding officer of R.A.F. Station Bridgnorth, A. Cdre. R. Coats has been appointed Air Officer in Charge of Records, R.A.F. Records Office, Gloucester. Before going to Bridgnorth in October, 1947, A. Cdre. Coats spent some two and a half years in the Middle East, first as Senior Officer in Charge of Administration at No. 206 Group, and finally as station commander at Shallufa. Born in 1904, he was commissioned from Cranwell 21 years later.

Field Service

AS many airmen as can be spared from duties will this year be lent to farmers to assist in harvesting food crops. A scheme similar to that employed in previous years has been drawn up, whereby R.A.F. regional welfare officers will co-ordinate requests for aid, and arrange the distribution of available airmen.

In certain circumstances, farmers may request short-term help from the commanding officers of airfields in their immediate vicinity, and where their own or other local harvest vehicles are insufficient, they may hire R.A.F. transport. In addition to these arrangements, airmen and airwomen are encouraged to volunteer for farm work in off-duty hours.



EXIT A WARRIOR: Just one of many packed wartime episodes in the career of the Bristol Beaufighter is recalled by this picture, taken on beleagured Malta in 1942. As related in the adjoining paragraph, the last Beaufighter-equipped Squadron is to be re-equipped with Brigands; only a few "Beaus" will remain in Service, at training establishments.

A Fighter's Retirement

AFTER nearly nine years' splendid service, the veteran Bristol Beaufighter is to be withdrawn from active operations. The R.A.F.'s sole remaining "Beau" squadron—No. 45, based at Kuala Lumpur—is soon to be re-equipped with Bristol Brigands. Conversion training and re-equipment will be arranged to avoid interference with current Squadron operations against Malayan terrorists.

The prototype Beaufighter first flew in July, 1939, and production models, fitted with Airborne Interception radar, were delivered in September, 1940; five night-fighter squadrons were fully equipped by the late spring of 1941. Front-line service was not confined to night-fighting, however, and the Beaufighter's ground strafing activities in the

Service Aviation . . . . .

Western Desert and the Burma jungle, and its attacks on enemy shipping, will take a prominent place in any future chronicles of the air-war. Equal versatility is likely to be offered by its successor, the Brigand. Powered by two Centaurus 57s, giving a total take-off power of 5,640 h.p. (with water-injection), the Brigand has a crew of three, and carries an armament of four nose-mounted 20mm Hispano guns, and one 0.50in Browning for rear defence. Bomb loads of up to 3,200 lb may be carried. Maximum speed at 14,000ft is 345 m.p.h.

Brooklands Cadets Parade

DUE to a "previous engagement," No. 11F (Brooklands) Squadron, senior unit of the Surrey Wing, A.T.C., was unable to take part in the Surrey Rally on June 12th. The engagement was the ceremonial opening of a new hut at Chertsey, provided by the Air Ministry for one of the Squadron's four flights. Cadets of the Byfleet, Send, Chertsey and Walton flights paraded, under the C.O., F/L. May, outside the new premises for the opening ceremony, which was performed by Mr. A. T. Ledger, of the Brooklands Squadron Committee. The hut, which contains an office, central hall, lecture room and workshop, will accommodate 50 cadets. No. 11F Squadron's headquarters are situated beside the famous Brooklands track, on the airfield now owned by Vickers-Armstrongs, Ltd. On the same site, the Squadron was founded, as part of the pre-war Air Defence Cadet Corps, over ten years ago.

Auxiliary Observers

AT Kenley recently, *Flight* learned something of the composition and work of the Auxiliary Air Observation Post Force, establishment of which was announced earlier this year. The force comprises five squadrons (one to each Group in Reserve Command) which, although part of the R.Aux.A.F., are at the tactical disposal of the Army and possess T.A. commanding officers and pilots.

Kenley is the base of No. 661 Squadron Headquarters, which administers five flights and a mobile servicing section.

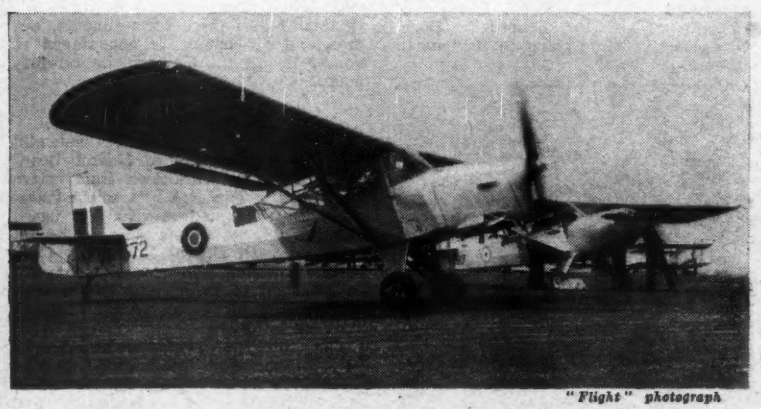
Auster 5s and 6s, two of which are illustrated below, equip the Squadron. Four of the flights—two at Kenley and two at Henlow—were formed on May 1st, and a fifth will begin training at Hendon in July. The Squadron, which is now commanded by Lt.-Col. Bazeley, D.S.O., was originally formed in November, 1943, first went into action in North-West Europe, and numbers among its achievements some particularly accurate spotting work for the guns, stationed at Dover, which were directed against those at Calais. Similarly, all the new A.O.P. squadrons revive the designations of war-time units.

Each flight is tactically grouped into four mobile and largely self-supporting sections, which consist of a pilot, two T.A. driver-operators, and a fitter and rigger (both R.Aux.A.F. personnel). Sections have their own motor transport, in which stores and radio equipment are carried, and which, in action, virtually become a "home" for their members.

The self-supporting character of these sub-units which make up the squadrons is dictated by operational necessities. During battle, a flight might well come under command of a squadron H.Q. other than its own, due to movement of the corps to which it had been assigned. An extremely close working spirit results from this type of operational structure, and when the squadrons are fully established there should be little difficulty in maintaining good recruiting.

Activity at present consists mainly of refresher training—at Kenley, 661 Squadron's regular R.A.F. adjutant, F/L. Bentley, is in charge of flying instruction—but as units get into their stride, there will be full-dress observation exercises, in co-ordination with artillery regiments of the Territorial Army. Efficiency of this combination is guaranteed by the fact that pilots are, first and foremost, specialized gunnery officers, provided with the necessary flying qualifications by R.A.F. methods.

WORDS OF WELCOME: Addressing delegates at the opening of the annual conference of the Royal Air Forces Association, held at Margate from June 11th—12th, is the Mayor of that town, Alderman W. C. Redman. On the right is Air Marshal Sir Richard Peck, now President of the Association, who took the chair.



"Flight" photograph

FOR ARMY AIRMEN: Territorial Army pilots fly these Austers of No. 661 (A.O.P.) Squadron, R.Aux.A.F., seen at Kenley, the Squadron's base. Both Auster 5s and 6s at present equip the A.O.P. reserve force, some details of which are given above. Shown on the left is a Gipsy-engined Mk. 6, while the characteristic "face" of its companion identifies it as a Lycoming-powered Auster 5. Each flight has six Austers, two of which are reserve aircraft.

R.A.F. Permanent Commissions

THE following officers have been selected for permanent commissions in the Royal Air Force, in the branches shown:

GENERAL DUTIES BRANCH.

Flight Lieutenants: W. R. Birdling, D.F.C., D. S. Brundell, T. Derrick, M. H. Exton, D.F.C., A. R. Galbraith, D.F.C., S. R. Hodge, S. J. Houghton, C. H. A. Mitchell.

Flying Officers: E. J. R. Downs, S. G. Knight.

TECHNICAL BRANCH.

Squadron Leaders: F. T. Baynham, W. C. B. Bartlett, P. Clarke, L. E. Farrell, J. T. Main, O.B.E., G. W. F. Penwarden, R. W. Searles, S. G. Wright, A.F.M.

Flight Lieutenants: R. Cogger, W. T. Dunlop, B. H. Goodsell, W. H. Warren, W. A. Yardley.

EQUIPMENT BRANCH.

Flight Lieutenants: T. W. Dodd, M. J. S. Sargent.

Flying Officers: S. E. Cope, S. Dwight, T. V. Nicholas, D.F.C.

R.A.F. REGIMENT.

Flying Officer: A. K. Rust.

AIRCRAFT CONTROL BRANCH.

Flight Lieutenant: E. L. Horsfall.

PHYSICAL FITNESS BRANCH.

Flying Officer: W. Paul, B.E.M.